

University of South Wales



2039262

**THESIS**  
**for**  
**DOCTORATE of PHILOSOPHY**

Causes of Delays in Construction Projects &  
How the Project Manager Can Act to Avoid Delays

By

**Mamoon Mousa M. Atout**

**University of Glamorgan**  
**Wales, U.K.**

May-2008

This Thesis is submitted as a part fulfillment of the  
Doctorate of Philosophy in Engineering and Construction  
Management at University of Glamorgan

Director of Study: Dr. Z Ren - School of Technology  
Second Supervisor: Dr J Protheroe Jones-School of Technology

## **ABSTRACT**

This thesis presents the findings of both personal experience illustrated by case studies, and questionnaire surveys aimed at identifying the most important causes of delays in civil engineering construction projects in Dubai from the viewpoint of construction contractors.

Dubai presents a special set of circumstances in which the Project Manager has to operate e.g. rapid growth in construction, tight construction times, the unique architectural features of many project designs, international contractors and consultants, a multinational work force and readily available investment. Results of this study indicate that the Client, the Consultant and the Contractor contribute to the causes of delays due to the improper implementation of project management principles and misunderstanding of the design process and the design management and procurement contract processes. These accumulated factors are considered as the principle reason for the problem experienced at the project construction stage.

This thesis investigates the major factors causing project delay by demonstrating, illustrating and evaluating the roles of the construction or project manager and in avoiding project delay. The results are based on the questionnaires survey combined with interviews carried out with project managers and case studies.

Parties involved in the project must fulfil their contractual, technical, financial and legal roles. This starts with the Client (or his representative) in appointing a project management firm to prepare all advance studies and advise the Client on how relevant information about the project presented clearly to the Consultant and the Contractor.

Proper guidelines should be established to help the Client choose the appropriate type of contract, and experienced consultant and contractor, to execute the project.

Specific causes of delay are identified and recommendations are made as to how the Contractor's Project Manager can limit the occurrence of delays in projects, particularly in Dubai.

## **ACKNOWLEDGEMENT**

### *Thanks to God*

I wish to acknowledge my thanks and my appreciation to those without whose help; this modest effort would not have come to realization. Many people contributed to this thesis and without their help it would not have been possible to complete the same. Therefore, I like to express my gratitude to them especially to the Managing Director Mr. Abu Bakr Al Hamid of M/s Saudi Binladin Contracting Group and his deputy Mr. Hashim Al Safi.

Many thanks to Manager-Technical Affairs, Contracts Manager, All Project Managers, Project Engineers & Site Engineers of other contracting firms in UAE who gave me their precious time for interview and filling-out the questionnaire to make this thesis possible.

I would like to thank my advisor Dr. Ren Z. and Dr. J. P. Jones of University of Glamorgan for his immediate and direct replies in obtaining all sources regarding this subject. Special thanks to Engr. Mohammad Tawanaee - Manager Technical Affairs of Saudi Binladin Group (U.A.E. Branch) for his special generous efforts. Special respect & appreciation to Miss Suhair and my ex-wife Mrs. Nadia.

My thanks to my father, mother, brothers and sisters who were encouraging me to complete my higher education up to no limit and many thanks to my sons Sami, Mohammed and to my daughters Sammur, Farah, Nour and Bodour.

Special thanks to Society of Engineers and Society of Contractors in U.A.E. for allowing me to become their approved instructor for Engineering, Project Management and Construction Management courses for last five years to Managers & Engineers who are working in Engineering Construction Industry firms of private and public sector in UAE & Arabian Gulf and a special thanks to Shafeeq A. Ghafoor for his support and contribution.

My special respect, thanks and appreciation to:

**My Wife-Mrs. Rana**

for her patience and understanding for what I am doing.

**“I SHALL NOT AND NEVER FORGET”**

## **TABLE OF CONTENTS**

<b><i>Section Title</i></b>	<b><i>Page No.</i></b>
ACKNOWLEDGEMENT .....	i
ABSTRACT .....	ii
TABLE OF CONTENTS.....	iii
LIST OF FIGURES .....	xi
LIST OF TABLES .....	xii
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 BACKGROUND .....	2
1.2 RESEARCH RATIONALE.....	3
1.3 RESEARCH AIMS AND OBJECTIVES .....	6
1.4 RESEARCH METHODOLOGY.....	7
1.4.1 Theoretical Background of Research Methodologies .....	8
1.4.1.1 Research Approach .....	8
1.4.1.2 Data Collection .....	10
1.4.1.2.1 Primary Data Collection .....	10
1.4.1.2.2 Secondary Data Collection .....	14
1.4.2 Thesis Structure .....	15
1.4.3 Methodologies adopted in Each Research Stage .....	17
1.4.3.1 Literature Review .....	17
1.4.3.2 Questionnaire Survey.....	19
1.4.3.3 Case Studies .....	21
1.4.3.4 Quantitative and Qualitative Analysis .....	23
1.5 SCOPE OF STUDY.....	24
1.6 PROPOSED CONTRIBUTIONS .....	25
1.7 DISSERTATION RESEARCH STRUCTURE.....	26
1.8 SUMMARY .....	27

## **CHAPTER 2: WORKING ENVIRONMENT IN DUBAI**

2.0 INTRODUCTION .....	30
2.1 LOCAL ENVIRONMENT .....	31
2.1.1 Federation.....	31
2.1.2 Economic Growth .....	32
2.2 BUILDING AND CONSTRUCTION INDUSTRY IN DUBAI.....	35
2.3 DUBAI REAL ESTATE SECTOR .....	38
2.3.1 Land Department .....	40
2.3.2 Building Regulations .....	41
2.3.3 Real Estate Development .....	41
2.3.4 Housing and Occupancy .....	43
2.4 DESIGN MANAGEMENT IN DUBAI .....	44
2.4.1 The Process of Building Design .....	46
2.4.2 Rates and Responsibilities .....	47
2.4.3 Managing Design Process .....	47
2.4.4 Planning, Monitoring & Control .....	48
2.4.5 Successful Design Management .....	48
2.5 SUMMARY .....	50

## **CHAPTER 3: THE IMPACT OF CULTURAL FACTORS ON MANAGEMENT OF CONSTRUCTION PROJECTS IN DUBAI**

3.0 INTRODUCTION .....	53
3.1 DEFINITION OF CULTURE .....	54
3.2 HOW CULTURE AFFECTS ENGINEER BEHAVIOUR.....	54
3.3 NATIONAL CULTURE DIFFERENCES .....	55
3.4 THE IMPACT OF CULTURE FACTORS ON THE MANAGEMENT OF CONSTRUCTION PROJECTS .....	56
3.5 SUMMARY .....	59

**CHAPTER 4: CONSTRUCTION OPERATIONS AND THE OBLIGATIONS  
OF CONTRACTORS, CLIENTS AND CONSULTANTS IN  
DUBAI.**

4.1 INTRODUCTION .....	62
4.2 CONTRACTING IN DUBAI .....	63
4.2.1 The Importance of the National Contracting Sector to Government Projects in Dubai.....	63
4.2.2 General Contracting and National Companies	
4.2.2.1 The Building Transaction and the National Firms .....	63
4.2.2.2 The Ability to Implement the Government Projects .....	65
4.2.2.3 The Quality on the Level of Implementation .....	65
4.2.2.4 The Speed of Implementation .....	65
4.2.2.5 The Governments Contribution in Reducing the Project Cost .....	66
4.2.2.6 The Pit-Falls for the Construction Companies .....	66
4.2.3 PROCUREMENT	
4.2.3.1 Definition.....	67
4.2.3.2 Contractual Relationship .....	68
4.2.3.3 Traditional Procurement in Dubai .....	69
4.2.3.3.1 Definition of Traditional Procurement .....	69
4.2.3.3.2 Selecting the Procurement Method .....	74
4.2.3.3.3 Choice of Appropriate form of Contract .....	77
4.3 CONTRACTOR'S OBLIGATIONS .....	79
4.3.1 Standard of Works .....	79
4.3.2 Statutory Obligation.....	81
4.3.3 Coordination and Management.....	82
4.3.4 Materials Transfer.....	84
4.3.5 Follow-up of the Consultant's Instructions .....	85
4.3.6 Updating the Master Programme of Works .....	85
4.3.7 Preventing and Avoiding Delays (on site).....	85
4.4 CONSULTANT'S OBLIGATIONS .....	88
4.4.1 Design Stage .....	89
4.4.2 Detailed Design.....	92

4.4.3 Consultant Roles and Obligations on Site .....	94
4.5 CLIENT'S OBLIGATIONS.....	95
4.5.1 Client Duties .....	96
4.6 SUMMARY .....	98

## **CHAPTER 5: IDENTIFICATION OF THE ACCEPTED KEY SOURCES OF PROJECT DELAYS.**

5.0 INTRODUCTION .....	100
5.1 COMMON DELAYS CAUSED BY THE CLIENT.....	101
5.2 COMMON DELAYS CAUSED BY THE CONSULTANT .....	102
5.3 COMMON DELAYS CAUSED BY THE CONTRACTOR.....	104
5.4 OTHER SOURCES OF DELAY FACTORS.....	107
5.5 DELAY CAUSED BY THE CONTRACTOR'S PROJECT MANAGER AND PROJECT TEAM MEMBERS .....	109
5.6 DELAY FACTORS CAUSED BY PROJECT ITSELF .....	111
5.7 SUMMARY .....	112

## **CHAPTER 6: QUESTIONNAIRE SURVEY, FORMULATION AND RESULTS**

6.0 INTRODUCTION .....	115
6.1 QUESTIONNAIRE DESIGN AND DATA COLLECTION.....	116
6.1.1 Common Causes of Project Delay .....	116
6.1.2 Analysis of Responses .....	119
6.2 ANALYSIS OF THE MAJOR CATEGORIES OF CAUSES OF DELAYS ....	122
6.3 DISCUSSIONS.....	128
6.4 SUMMARY .....	137

## **CHAPTER 7: CASE STUDY 1 AND 2**

7.0 INTRODUCTION .....	140
7.A.1 BRIEF DESCRIPTION OF PROJECT A .....	141
7.a.1.1 Contract details and Construction .....	141
7.A.1.2 Project Background .....	142
7.A.2 BRIEF DESCRIPTION OF THE PROJECT SPECIFICATIONS .....	143
7.A.2.1 Sub Structural Works .....	145
7.A.2.2 Super Structural Works .....	146
7.A.2.3 Elevation of Building and Special Features .....	147
7.A.2.4 Fit-Out and Interior Design Works .....	147
7.A.2.5 Electromechanical Works .....	149
7.A.3 INTRODUCTION TO CAUSES OF DELAY .....	149
7.A.3.1 Delay Caused by the Client .....	150
7.A.3.2 Delay Caused by the Consultant .....	152
7.A.3.3 Delay Caused by the Contractor.....	153
7.A.4 WORK PROGRESS IN GENERAL .....	154
7.A.5 FACTS AND CIRCUMSTANCE THAT CONTRIBUTED TO THE DELAY .....	161
7.A.6 SUMMARY OF CASE STUDY I .....	165

### **Part – B**

7.B.1 BRIEF DESCRIPTION OF PROJECT B .....	168
7.B.1.1 Contract Details and Construction .....	168
7.B.1.2 Project Background .....	169
7.B.2 BRIEF DESCRIPTION OF THE PROJECT SPECIFICATIONS .....	170
7.B.2.1 Sub Structural Works .....	172
7.B.2.2 Super Structural Works .....	172
7.B.2.3 Elevation of Building and Special Features .....	173
7.B.2.4 Fit-out and Interior Design Work .....	174
7.B.2.5 Electro Mechanical Work .....	174
7.B.2.6 Landscaping and all External Pavement .....	175
7.B.3 INTRODUCTION TO CAUSES OF DELAY .....	175
7.B.3.1 Delay Caused by the Client .....	176



7.B.3.2 Delay Caused by the Consultant .....	178
7.B.3.3 Delay Caused by the Contractor .....	179
7.B.4 WORK PROGRESS IN GENERAL .....	181
7.B.5 REAL FACTS AND CIRCUMSTANCES THAT CONTRIBUTED TO THE DELAY.....	189
7.B.6 SUMMARY OF CASE STUDY II.....	191

## **CHAPTER 8: COMPARATIVE ANALYSIS AND EVALUATION OF FINDINGS OF CASE STUDIES**

8.0 INTRODUCTION .....	195
8.1 COMPARATIVE ANALYSIS .....	196
8.2 COMPARATIVE ANALYSIS OF PROJECT 'A' .....	196
8.2.1 Comparative Analysis of Client Causes .....	196
8.2.2 Comparative Analysis of Consultant Causes.....	199
8.2.3 Comparative Analysis of Contractor Cause.....	202
8.3 SUMMARY OF COMPARATIVE ANALYSIS OF PROJECT 'A' .....	207
8.4 COMPARATIVE ANALYSIS OF PROJECT 'B' .....	211
8.4.1 Comparative Analysis of Client Causes .....	211
8.4.2 Comparative Analysis of Consultant Causes.....	213
8.4.3 Comparative Analysis of Contractor Causes .....	215
8.5 SUMMARY OF COMPARATIVE ANALYSIS OF PROJECT 'B' .....	218
8.6 SUMMARY OF PROJECTS 'A' AND 'B' .....	220

## **CHAPTER 9: HOW EACH OF THE MAIN PROJECT PARTICIPANTS CAN ACT TO REDUCE DELAYS IN THEIR ORGANISATION.**

9.0 INTRODUCTION .....	225
9.1 CASE STUDIES ANALYSIS .....	225
9.2 CAUSES OF DELAY BY THE CLIENT .....	229
9.2.1 Comparison of the Identified Client's Causes of Delay with the Case Study Discussion.....	229

9.2.2 Recommendations.....	234
9.3 CAUSES OF DELAY BY THE CONSULTANT.....	238
9.3.1 Comparison of Identified the Consultant's Causes of Delay with Case Study Discussion .....	238
9.3.2 Recommendations.....	249
9.4 CAUSES OF DELAY BY THE CONTRACTOR.....	249
9.4.1 Comparison of Identified the Contractor's Causes of Delay with Case Discussion .....	250
9.4.2 Recommendations.....	262
9.5 SUMMARY .....	267

## **CHAPTER 10: THE CONSTRUCTION PROJECT MANAGER'S ROLE IN REDUCING PROJECT DELAYS**

10.0 INTRODUCTION .....	269
10.1 CONTRACT ISSUES IN REDUCING DELAYS .....	270
10.1.1 Extending the Programme Submission Period up to 40 Days.....	271
10.1.2 Extending the Project Duration on Day of Signing the Letter of Intent and the Contract Agreement .....	272
10.1.3 Flexibility in Commencing Date .....	273
10.1.4 The Nominated Sub-Contractors .....	274
10.1.5 The Powers and Duties Delegated to the Resident Engineer .....	275
10.1.6 Confirming the Extension of Time.....	277
10.1.7 The lack of the technical experience of the Resident Engineer.....	278
10.1.8 Dealing with Unforeseeable Obstructions.....	279
10.1.9 Appointment of Sub-Contractors .....	280
10.1.10 Flexibility in Checking and Approving Construction Method Statements .....	282
10.1.11 Unrealistic Contract Duration.....	284
10.2 RECOMMENDATION RELATING TO CULTURAL FACTORS .....	285

**CHAPTER 11: CONCLUSIONS**

11.0 INTRODUCTION .....	290
11.1 CONCLISIONS .....	290
11.2 RECOMMENDATIONS FOR FURTHER STUDIES .....	293
 <b>APPENDIX</b> .....	 297
 <b>REFERENCES</b> .....	 303

## **LIST OF FIGURES**

<b>Figure No.</b>	<b>Description</b>	<b>Page No.</b>
1-1	Flow Diagram of Thesis Structure	16
2-1	Number of Contracting Companies in Dubai 1960's to 2002	36
4-1	Contractual Relationship in Traditional Procurement	72
6-1	Common Factors of Delay Caused by the Client with Serial Number as per Table 6-5	125
6-2	Common Factors of Delay Caused by the Consultant with Serial Number as per Table 6-5	125
6-3	Common Factors of Delay Caused by the Contractor with Serial Number as per Table 6-5	126
A.7-1	Cross Section of the Building	144
A.7-2	Cleaning and Plastering of Diaphragm Wall	145
A.7-3	Spider Wavy Glass Openings & Shear Walls at Corners	146
A.7-4	Fit-out and Interior Design Work	148
A.7-5	Tentative Construction Programme	160
B.7-1	Front and Right Side Elevation	171
B.7-2	Front Elevation Canopy and GRC Panel	173
B.7-3	List of Variation Orders	188
11-1	Major Steps to Avoid Delay	292

**LIST OF TABLES**

<b>Table No.</b>	<b>Description</b>	<b>Page No</b>
1-1	Severity Weighing Scale in the Research Survey	22
2-1	The Steps of Managing the Design Process	51
6-1	Common Causes of Delay by Client, Contractor & Consultant	116
6-2	Average of Severity Causes by Client	118
6-3	Average of Severity Causes by Consultant	119
6-4	Average of Severity Causes by Contractor	120
6-5	The Real Major Causes of Delay as per Results of Analysis	123
7A-1	List of Variation	158
8-1	Sources of Delay by Client for Comparative Analysis - Project 'A'	197
8-2	Sources of Delay by Consultant for Comparative Analysis - Project 'A'	200
8-3	Sources of delay by Contractor for comparative analysis - Project 'A'	205
8-4	Major Causes of Delay by Client and Results - Project 'A'	207
8-5	Major Causes of Delay by Consultant and Results - Project 'A'	208
8-6	Major Causes of Delay by Contractor and Results - Project 'A'	209

8-7	Sources of Delay by Client for Comparative Analysis - Project 'B'	212
8-8	Sources of Delay by Consultant for Comparative Analysis - Project 'B'	214
8-9	Sources of Delay by Contractor for Comparative Analysis - Project 'B'	216
8-10	Major Causes of Delay by Client and Results - Project 'B'	218
8-11	Major Causes of Delay by Consultant and Results - Project 'B'	219
8-12	Major Causes of Delay by Contractor and Results - Project 'B'	220
8-13	Summary of Comparative Analysis of Case Study I	222
8-14	Summary of Comparative Analysis of Case Study II	223
9-1a	Case Studies Evaluation Form (the Client)	226
9-1b	Case Studies Evaluation Form (the Consultant)	227
9-1c	Case Studies Evaluation Form (the Contractor)	228
9-2	Recommended Guidelines to Client	234
9-3	Recommended Guidelines to Consultant	245
9-4	Recommended Guidelines to Contractor	263
11-1	Recommendations for Mitigation of Delays	293

# **CHAPTER 1**

## **INTRODUCTION**

## **1.1 BACKGROUND**

Opening the construction industry in the Gulf States to competition from foreign Contractors is having an enormous impact on the construction industry in the region, for both the Contractors and the Clients. This is especially noticeable in Dubai, as rapid economic growth and investment in tourism, as a developing source of earnings, has led to rapid infrastructure development. This has meant a boom in construction which indigenous companies could not meet, hence the necessity to employ foreign companies in all sections of the industry.

Using foreign contractors has affected the construction industry both positively and negatively. On the positive side, competition has led to exposure to the best current practices in construction as a means to offer the Client attractive “cost, time and quality” elements in tenders for this lucrative market. On the negative side, many Contractors have become involved in protected contractual disputes and claims, with projects exceeding budget and time targets.

There is a legal requirement for foreign companies to form “partnerships” with local companies in order to qualify to tender for construction works, and this also applies in the sub-contracting sector. Difficulties arise due to the difference in the working procedures and systems operated by foreign and indigenous companies, and also within “partnership” companies. The situation is compounded in construction where there are many parties involved in a project.

It is not surprising therefore, that many contractors have become involved in protracted contractual disputes and claims, often resolved either by arbitration, significant compromise or legal processes.

The Contractor’s Project Manager working in the above environment will therefore face particular problems. As will become evident later in this thesis, that there is limited published information relating to such an environment, consequently this research is intended to provide an insight into the environment the Contractor’s



Project Manager has to operate, and in particular to identify causes of delay and provide guidance on how to avoid them.

This chapter presents a general overview of the thesis consisting of a brief introduction and description of the subject matter of the research as well as the specific problems being studied. It also sets out the hypothesis, aims and objectives, the manner in which the research was carried out, a summary of its achievements and the structure of the thesis.

## 1.2 RESEARCH RATIONALE

In construction, a delay means a time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project. From the Client's point of view, as most of them are government agencies for civil engineering projects, a delay generally leads to social inconvenience and loss of revenue. It can also cause the Contractor to suffer a loss of productivity, high disruption cost and prolongation cost.

Previous researches have identified many factors that contribute to project delays, such factors as the lack of experience of incorporating the specifications and conditions of contract to the details and the procedure of the construction process.

**Bramble B. and Callahan M. (1992)** stated that *"A project may be delayed as a result of the direct action of major parties or of their failure to act especially if they have a duty to act. Also they added, outside forces could be intervening to delay a project."*

**Assaf S. and Mohammed A. (1995)** studied the causes of delay in large building projects in Saudi Arabia and identified material related delays as the main cause of project delay. **Mansfield N. et al. (1994)** looked into the causes of delays and cost overruns in public high way and building projects and found that *"There was very good arrangement between the professionals surveyed on those factors that could delay and cost overrun. The four most important items agreed by the Contractors,*

*Consultant's and Client's surveyed were the financing of and payment for the completed works, poor contract management, change in the site conditions and shortage of materials".*

**Odeyinka H. and Yusif A. (1997)** studied the causes of delays in Nigeria housing projects and found that *"The Client attributes to the delay from variation orders, slow decision making and cash flow problem while the Contractor attributes the delay from financial difficulties, material management problem, planning and scheduling problem and shortage of man power. The Consultant attributes to the delay by submitting incomplete drawings, slow response, late issuance of instruction and poor communication"*.

**Ajibade A. and Henry A. (2006)** identified the sources of delays caused by the Client, the Consultants, the Contractors and Sub-Contractors and those which are not caused by these parties to the design and construction process.

Delays are the most common and costly problems encountered on construction projects. Early identification and mitigating the effects of construction delays has become an integral part of the project life cycle. Even with today's technology and understanding of project management, construction projects continue to suffer from delays; project completion dates frequently become extended. There are many reasons why delays occur such as rework, strike, poor organization, material shortage, equipment failure and so on. In practice, attempts are made to identify the cause of delays and schedules are modified to incorporate the revised project duration.

Other accepted sources of delays are changes in the initial design, alternations to the specifications and unforeseen circumstances such as unexpected ground conditions, poor weather or poor design which is only discovered during construction. Delay and disruption can also be caused by people issues, for example individuals or organizations not responding to the requested information within the appropriate time or individuals not agreeing on technical or management issues for an unreasonable period of time.

**Hensey M. (1993)** stated that *"The main cause of construction delays was material, labour, equipment and financial factors"*. Also counted among the causes of postponements were improper planning, lack of control, Sub-Contractor delays, poor coordination, inadequate supervision, improper construction method, technical personal shortages and poor communication.

**Scott S. (1997)** stated that *"The main reasons for the project delays are the changes of the contract document, inadequate supervision, late agreement with the Sub-Contractors and insufficient labour"*.

**Chan D. and Kumaraswamy G. (1997)** conducted a survey to evaluate the relative importance of 83 potential delay factors in Hong Kong construction projects. They found *"The five principal and common factors: poor risk management and supervision, unforeseen site conditions, slow decision making involving all project team, the Client initiated variations and necessary variation of works"*.

**Proverbs D. and Holt G. (1999)** confirmed that *"The project time performance could be achieved by managing the three major concepts: construction method, labour utilization, and monitoring the productivity rate."* Failure of the Contractor in achieving the time performance and the construction practice could cause a major delay to the project completion.

**Pickavance K. (2000)** revealed that *"Poor site management can cause project delay and affect productivity. Good practice is thus essential during the planning and execution of the work and in the operation of the contract"*

**Aibinu' A. and Jagboro G. (2002)** in their study of growing problem of construction delay in Nigeria examined the effects of delays on the delivery of construction projects in the country. They found that *"Time and cost overruns were found to be frequent effects of delay. The acceleration of site activities coupled with the improved Client's project management procedure and the inclusion of an appropriate"*

*contingency allowance in the pre-contract estimate were recommended as a means of minimizing the adverse effect of construction delay”.*

Identifying the various causes that contributes to projects delays is an important step in resolving it. The construction industry needs to develop methodologies and techniques to prevent and more efficiently resolve delay problems.

The rationale behind this research is to identify the major factors relating to the delay in construction projects in Dubai and the underlying problems which cause the delays. This could provide the basis on which to make recommendations that would be of benefit to practicing Project Managers and to those with a more academic interest. Researchers have studied factors causing delays; various methods have been used to classify these factors. However, few of previous empirical works have described the problem of delays by looking in detail at the actions and inactions of project participants.

The author's objective was also to relate his professional experience as a Project Manager in many large contracts to developments in academic and scientific knowledge in Engineering Project Management. It was considered that this could be best achieved by using a combined questionnaire and case studies approach as a means of comparing academic prediction of delay causes and the actual occurrence of delays in projects. This provides a proactive approach to identifying prime sources of major delay and to reduce proposals to the occurrence and impact of these delays on projects.

### **1.3. RESEARCH AIMS AND OBJECTIVES**

This research is primarily concerned with the role of the Contractor's Project Manager in reducing delay on major building projects in Dubai. This is confirmed as one of the prime functions of the Project Manager by **Munns A. and Bjeirmi B. (1996)**. *“A project can be considered to be the achievement of a specific objectives, which involves a series of activities and tasks which consume resources, the Project*

*Manager should understand the objectives and he must give the maximum efforts of his roles and responsibilities which is a part of his duties to achieve the activities of work without delay.”*

This research aims to identify the primary causes for delay in major building projects in Dubai and to categorise them in terms of the impacts they have upon the final project completion time. In addition, it aims to identify the root, or “trigger”, cause of the delay and the source of the delay contributed by different project participants (i.e. the Client representative, the Consultant, the Contractor or the Sub-contractor).

To achieve the above research aim, the following specific research objectives are set:

- 1) To identify the causes of project delays in Dubai by the contributing parties as perceived by contracting organisations. Given the unique social, environmental, technical and contractual conditions, the major causes of project delays in Dubai could be significantly different from other countries or regions.
- 2) After identifying the root causes of delays and their source, to then identify the significant causes and identify actions by the major project contributors, to mitigate the delays for which they are individually responsible.
- 3) To develop a serial of recommendations for the Contractor’s Project Manager to mitigate the occurrence and impact of the project delays in Dubai. The prime objective is to establish useful recommendations which, if implemented by the Contractor’s Project Manager could mitigate the factors relating to project delays. Even if the Contractor’s Project Manager is not responsible for the root or “trigger” event that causes a delay, he may be in a position to identify the delay potential of such an event and be able to mitigate its effect by an appropriate pro-active and timely action.

## **1.4 RESEARCH METHODOLOGY**

In order to achieve the research aim and objectives, a combination of comprehensive research methods were adopted in this research including literature review,

questionnaire, case studies, and quantitative and qualitative data analysis. This section first reviews the theoretical background of various research methodologies; then presents the overall research process; and discusses the research methods adopted in each research stage.

#### **1.4.1 Theoretical Background of Research Methodologies**

The aim of this section is to describe the various methods that are available to the Author when conducting the research, and offer definitions and explanations.

##### **1.4.1.1 Research Approach**

The research methodology was devised from the analysis of the two main approaches to data collection: quantitative and qualitative research, both of which are defined in detail below in order to allow the researcher a satisfactory understanding of how these methods are utilised in order to develop a detailed research methodology.

- **Quantitative Research:** *“Quantitative research is ‘objective’ in nature. It is often defined as an enquiry into a social or human problem, based upon testing a hypothesis or a theory composed of variables, measured with numbers and analysed with statistical procedures in order to determine whether the hypothesis or theory hold true” (Naoum S., 1998). Davies M. (2007) further defines quantitative research “as the application of statistical procedures which have been developed in order to increase the likelihood that the information gathered will be relevant to the question asked and will be reliable and unbiased”.*

In short, quantitative analysis is the examination of data collected via survey techniques through statistical methods in order to ensure that the data collected is both reliable and significant. These statistical methods are also used to analyse the data for trends and thus prove or disprove research hypothesis. Quantitative research will form an important part of this research document with the statistical analysis of data collected from a structured questionnaire. Results formulated from this data will enable the researcher to determine whether the research objectives

have been met and the hypothesis discussed in the previous chapter proved or disproved.

- **Qualitative Research:** *“Qualitative research as opposed to quantitative research is ‘subjective’ in nature. It is defined as emphasising meanings, experiences (often verbal described) and description. The information gathered in qualitative research can be classified under one of two categories of research, exploratory and attitudinal” (Naoum S., 1998). Davies M. (2007) further describes this qualitative approach to research as “the study of things in their natural setting, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them”.*

For the purpose of this research it is important to explore the meanings of exploratory research and attitudinal research in order to determine which, if any, of these techniques best applies to the nature of the research being conducted. *“Exploratory research is used when there is a limited amount of knowledge on the topic area and is used for the diagnosis of situations and the screening of suggestions” Zikmund W. (1997) “Attitudinal research on the other hand, is used subjectively to evaluate the ‘opinion’, ‘view’, or the ‘perception’ of a person towards a particular object” (Naoum S., 2004).*

It is evident that both quantitative and qualitative research is required to be undertaken during the completion of this research. Quantitative statistical techniques was utilised in order to examine the raw data collected via the distribution of a structured exploratory questionnaire. These quantitative techniques enable the researcher to determine the rank of the major delay causes and whether the data collated is reliable and significant.

Upon completion of the quantitative research, qualitative research was conducted in the format of case study, in order to further examine whether the results identified in the quantitative research were valid. This form of research aids the development of conclusions as it provides not only ‘what’ the results are, but ‘why’ they have occurred.

#### **1.4.1.2 Data Collection**

**Davies M. (2007)** identifies that *“there are two main types of data which can be collected researchers in order to develop the results which they require. These are primary and secondary data, and each will be dealt with in turn in order to describe how each type of data will be collected”*.

##### **1.4.1.2.1 Primary Data Collection**

Primary data are generated by a researcher who is responsible for the design of the study and the collection, analysis and reporting of the data. The researchers can describe why and how the data were collected and can also mention the method used for analysis of the data. Primary data can be collected from various sources, the only concern here is that the result should be directly communicated between the researcher and the source and the result should be carried out by using a particular method of analysis. In primary research, the researcher is responsible for the research design; collection of the data and analysis and interpretation of the data. So, the researcher has the control for the production and analysis of the data, and the author can judge the quality of the data. But this judgment is much more difficult than secondary data (**Blaikie N., 2000**). There are several commonly adopted primary data collection approaches: observation, experimentation, questionnaire, interviews, and case study.

##### **a) Observation**

This method of collecting information, which eventually becomes important data for the research, is by observations where we record and recognize the behaviours. *“Observation is useful in collecting data about behaviour which the respondent is unaware of or unwilling to discuss, and potential bias caused by the interviewing process is eliminated”* (**Babbie E., 2002**). Observation methods are therefore far less frequently used than the communication methods. Observations methods can be classified by different ways. The setting may be natural or artificial, e.g. watching people shopping normally as opposed to in a mock ‘store’ created for the purpose of



the research. Observations can be hidden from the respondents whether they are aware of being observed. *“Observation can be structured or unstructured, by structure we mean that observers exactly know what they are to measure and how it is to be measured, while in unstructured observation observers monitor any behaviour that seems relevant to the research questions”* (Davies M., 2007).

**b) Questionnaire:**

Questionnaire surveys are a method of collecting data by asking respondents to complete a questionnaire. And a questionnaire may include a series of set questions and either provides a space for an answer or gives a number of fixed alternatives from which the respondent has to select. Researchers will frequently make a sample in order to understand or take views of some populations. Here, the term population means a collection of individuals, communities or nations from whose researchers wants to make a general statement. With questionnaire the interpretation of the data collected is more straight-forward than other methods, because mostly you need to transfer data from a structured response sheet to similarly structured grid (Davies M. 2007). Surveys can be a relatively less expensive method of collecting data from a large number of people. They can produce reliable and valid responses on many issues.

*“This form of data collection is the most widely used source of primary research amongst researcher as it provided access to a wide range of professionals which would normally be beyond the reach of most researchers”* (Naoum S. 2004). The advantages and disadvantage of questionnaire can be summarised as follows:

- **Advantages:** *“The questionnaire covers a wide geographical area and thus enables the student to collate data form a wide variety of professionals, operating within different organisations”* (Delbert C., 1991). *“It also offers a quick method of returning mass information within a relatively short period, with most responses being received within the first two weeks of distribution”* (Naoum S., 2004). Finally, *“the questionnaire gives the respondent a sense of privacy due to their anonymity, therefore allowing for more accurate information to be imparted”* (Delbert C., 1991).

- **Disadvantages:** Firstly, the researcher has no control over the respondent and it therefore impossible to ensure that the correct person completes the questionnaire and fills it out accurately. *“This will therefore bring the reliability of the data into question and this must therefore be considered when compiling results”* (Naoum S., 2004). Closely linked to the above is the fact that the industry is swamped by a steady stream of questionnaires, leading to fatigue amongst respondents and a low expectation of returns. *“Within the built environment a return rate of 20-30% is considered to be within the top range for academic research”* (Akintoye F. and Fitzgerald E., 2000). Also, the questionnaire does not allow the flexibility of discovering ‘why’ a particular answer has been given as there is no opportunity for clarification. *“This will therefore have the effect of producing limited results”* (Naoum S., 2004). Finally, questionnaires must be used with literate person only and wording of the questions should be straightforward so that most of the people able to handle the language, and understand the questions properly. *“If a researcher wants to explore the topic in-depth then a personal interview is necessary”* (Denzin N. and Lincoln Y., 2000).

### c) Interview

A formal interview may be conducted as opportunity permits to the formal, pre-arranged interview; whilst *“an informal interview demands a more probing, spontaneous and unstructured technique governed by the situation rather than by the topic of interest. The semi-structured interviews fall between these two categories”* (Gummesson E., 2000).

Interview is often used for gathering opinions about a subject. However, the data obtained through this research method is not suitable for generalisation to any population. *“Data is obtained from too small a sample and, because of certain attributes, a sample is drawn to include specially selected research participants”* (Babbie E., 1986). The aim with this kind of research is to gather insight into a problem from an informed group of people rather than quantitative data from a sample of research participants. The results of a qualitative study can indicate the scope of possible matters on a subject, but does not indicate how many people in a population

will agree with a certain statement. *“This structured interview technique will provide advantages to the research in the fact that the answers obtained will be more accurate and the answers can be explored in full, finding out ‘why’ the particular responses were given”* (Naoum S., 2004).

#### **d) Case Study**

*“Case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and it which multiple sources of evidence”* Yin R. (2003). It deferrers *“from action research in that the case study researcher seeks to study (organisational) phenomena and not to change them, unlike the action research who is often directly involved in planned organisational change”* (Avison D. et al., 2001).

According to Johnston W. et al. (1999), *“good and effective case study research should have the following elements: the research must begin with hypotheses developed by theory; the research design must be logical and systematic; and the findings must be independently evaluated”*. *“Hence case studies are best used in studies that require deeper understanding of how and why things happen rather than testing the relationships between them”* (Gordon W. and Langmaid R., 1998).

*“The key strength of cast studies research is that it suitable for learning more about a little known or poorly understood situation”* (Leedy P. and Ormrod J., 2001). *“They also enable the researcher to compare a number of different approaches to the same problem in sufficient detailed as to be able to draw out lessons which have general applicability”* (Moore D., 2000). In addition, *“case studies can help in achieving greater realism in research, and requires a reasonably holistic research”* (Graham M., 2000). It may also be useful for investigating how an individual or program changes over time, perhaps as the result of certain circumstances or interventions.

*“The weakness of cases studies is that they are usually restricted to a single event or organisation; it provides a limited basis for the traditional ‘scientific’ generalisation”* (Yin R., 2003). Hence they are often used for complex processes, their antecedents and outcomes; this process may last for months or years and the concerned people

may not wait for publication of the research result and when they are published may become out-of-date. *“Another weakness of them is that the data collection and analysis process may be influenced by the researcher’s interpretation of events, documents and interviews”* (Drake P. *et al.*, 1998).

#### **1.4.1.2.2 Secondary Data Collection**

Secondary information is source of data and information collected by other researches and it has been written in some form. *“Secondary data are almost used by researchers before doing the primary research and most researchers starts their efforts with some type of secondary analysis. Secondary data helps to investigate and learn what is already researched or known and also helps to find out what yet remain to research about a particular topic”* (Strauss A., 1987). Secondary information allows researchers to understand which way the primary research should be carried out. It helps to understand the types of questions should be addressed, the type of method should be used for the primary research and also helps to find out the relevant respondents of the primary research.

*“The sources of secondary data include government reports, industry studies, and syndicated information services as well as the traditional books and journals found in libraries”* (Strauss A. and Corbin J., 1990). Secondary information can be found out very quickly and also can answer some questions very easily. Also, it is also very cost effective. The fundamental disadvantage of secondary information is that the research carried out by other researchers may not be the same as required to carry out the current research. *“The questions addressed or the method used for those questions by the researcher could be different and the interest of the researcher might not be the same as the current researchers”* (Blaikie N., 2000). Also, *“it is not easy to find what changes the researcher has made while analyzing the resul”* (Miles M. and Huberman A., 1994). There are various sources of obtaining secondary data which can be used in the research. It includes academic sources such as text books, journal and research papers. Apart from this, data can be collected from reliable web sites. All the above sources can be use collectively to understand and to make a base for primary research.

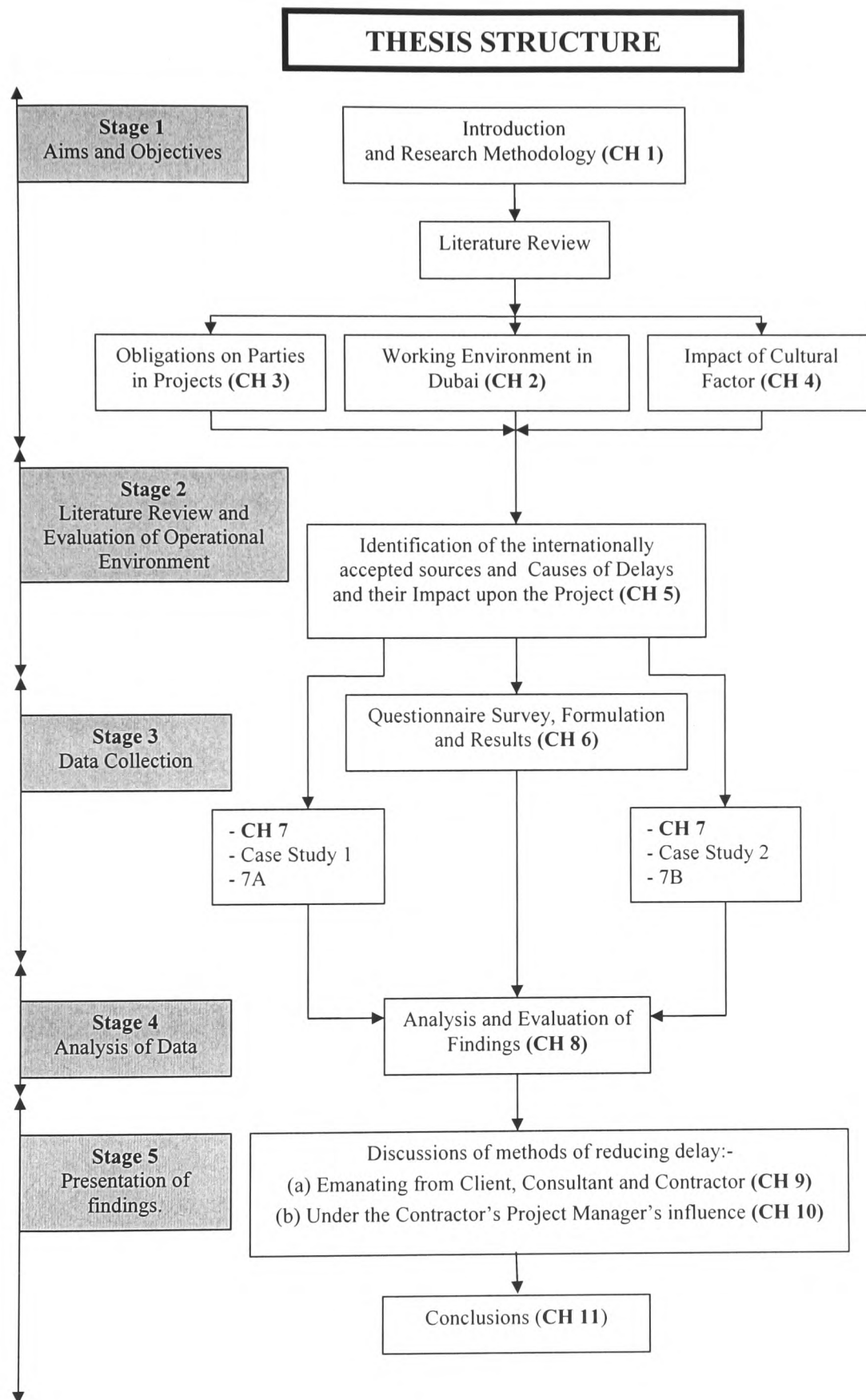
### **1.4.2 Thesis Structure**

This research process is presented in five major stages as indicated in Fig. 1-1 “The flow chart of thesis structure.” These stages are summarized as follows:

1. The current status of construction and project management in Dubai in relation to the causes of project delays and the general plans and strategies for their reduction was through a literature review. Other related issues such as culture, traditions and habits were also explored to find out how they would impact the work progress.
2. Based upon the above two sections, another section was generated from the questionnaire to find out the primary causes of delay. This led the formulation of the measurement of the relative severity of delay in terms of their negative affection upon the project. Accordingly, the root causes of the delay were also established; responsibilities were also assigned.
3. Case studies were then conducted and analysed to determine the major causes of delays which would be considered as a primary data to provide the source for identifying the causes and reasons of the delay that actually occurred.
4. A comparative analysis was conducted between the theoretical sources of delay and their severity and the causes of delay found in the case studies.
5. Discussion and the finding of the comparative analyses were explained to conclude and recommend how the Contractor project manager would act to reduce the delay in two ways, internally and externally. Internally, by controlling the factors which are under his direct control, externally by advising all involved parties in advance how to control the cause or how to mitigate them.

The following research methods were adopted at each research stage:-

- 1) Literature review which is adopted in Stages 1 and 2.
- 2) Questionnaire which is adopted in Stage 2.
- 3) Case study and analysis is adopted in Stage 3.
- 4) Qualitative analysis which was adopted in Stage 4.



**Figure 1-1: Flow Diagram of Thesis Structure**

### **1.4.3 Methodologies adopted In Each Research Stage**

This section describes the various methods selected in this research with the reasons for their selection and the prediction of the results. The scientific analysis and the extensive professional experience in construction and project management and the academic knowledge of the author forms a solid base to develop the research methodology which is specified into different stages. Process, principles and procedures were adopted and covered in details to achieve the research methodology through a proper investigation to the problems.

#### **1.4.3.1 Literature Review**

Many different source of literature (books, journals, papers, articles) were reviewed in this research. The review focused on various aspects of the causes of the project delay. The literature reviews provide useful guidelines and information on the construction management concepts and how by applying it can help point out the faults that will lead to delay. Those literature reviews were also used to guide the formation of questionnaire and interviews design.

The core sources of references have been consulted in order to provide the basis of evidence and information along with the technical necessary data to enable the research/dissertation to be reported. The issues and the topics were developed by collecting the literature resources at the early stages during the preparation of the report. Much information was collected to support and cover the facts of the literature sources and other publications. Many information and similar research was also founded in the professional journals where a few specific text books and a series of articles from an international magazine which contains very useful information had served, helped and satisfied the researcher to support his dissertations.

The recent academic journal has also provided an excellent source for the published information about the topic which helped the researcher to complete his research. The questionnaire was also one of the major issues which helped and supported the picked articles founded in the academic and scientific journals. The attached list of

references and bibliography are also helping the researcher and the reader to have an idea about the whole research.

In construction, a delay means a time overrun either beyond the contract date or beyond the date that the parties have agreed upon for delivery of the project. In both cases, a delay is usually costly.

The purpose of this research is to identify the major factors of construction project delay and how the Project Managers must act to reduce it. The sources of the delay will be compared with the identified sources of the delay in the case studies noting that the case studies will be analyzed to identify and to establish the root causes of the delay and their severity.

The sources of the literature were based on:

- Published books in Engineering Project Management
- Published books in Engineering and Construction Management
- Published literature of Project Management
- Published articles of International Journals of Project Management
- The author of Technical and Managerial Experiences
- Other various publications related to Construction and Project Management.

Most of these sources led the author to develop the Project Management strategies/procedures for contracting organizations to be considered effectively to reduce the cause of the delay.

Handing over the projects on time is one of the major concerns of the project participants. Finding and analyzing the factors of the project delays is helping to mitigate and to reduce the disputes of the participants. Many researches had already made by the specialists on this area to find out the major factors affecting the work progress through many models to avoid and reduce the problems. Many researches have been undertaken about the project participant attributes and the roles of the Contractor's Project Manager. The impact of the attributes had discovered the strength and the weakness of the factors along with the roles and skills of the



Contractor's Project Manager. The literature study focuses on the previous studies which identified and determined the causes of project delays locally and internationally. Many construction projects suffer from delay and construction delays are common in civil engineering projects. All project participants agreed that construction delays are disruptive and expensive. Describing the causes by looking at factors relating to the actions and inactions of project participants is important especially in a state like Dubai.

The literature review, Chapter 2 to Chapter 5 examines the environment of the Contractor's Project Manager under a series of headings, and is used to produce itemized listings of recognized causes for delays. Some of these factors may occur internationally and some may be specific to Dubai.

The collected data will be used as the basis for deriving as a series of questions that are to be included in questionnaire (see Stage 3), to establish if the commonly accepted reasons for delay in Dubai correspond to those internationally.

#### **1.4.3.2 Questionnaire Survey**

The survey questionnaire was developed to assess the perceptions of the Clients, Consultants and Contractors to the relative importance of construction delay causes. The main objective of the questionnaire survey is determine the management's responsibilities and the approaches used to minimizing the effect of the delay and to identify the types of the delay in construction and to obtain the feedback on procedure used to mitigate the effect of delay. The survey was designed and conducted based on 53 well recognized causes of delay which were obtained through an extensive literature review. Participants were asked to indicate the level of importance of each cause. These causes were categorized into three major groups:

- 1) The Client: Related factors include finance, payments, Client interference, slow decision and unrealistic contract duration.
- 2) The Consultant: Related factors include contract management, preparation and approval of submittals and materials and site supervision.

- 3) The Contractors: Related factors include site management, improper planning, inadequate contractor experience, mistakes during construction, preparing the construction methodology.

Other significant issues of concerns such as project location, site conditions, neighbours, and changes, materials including quality and shortage and the nominated Sub-Contractors were also considered in the questionnaire survey.

Two rounds of questionnaire survey were conducted.

- In the first round, questionnaires were distributed to 52 construction companies who worked on large and medium projects in Dubai with project values ranged from Dhs. 150,000,000/- approximately US \$ 41,500,000/- and above up to US \$ 150,000,000/-.
- Based on the result analysis of the first round questionnaire, a second round survey was conducted to further clarify some of the key questions. 10 more major construction companies were involved in this round. All of the participants in the questionnaire survey were qualified and approved by the Dubai Municipality as a “first class” and “second class” the Contractors under the government (classification system).

Questionnaires were sent to the general managers, manager of technical affairs, project department managers, site project managers, chief engineers and construction managers who had experience in project construction work. This was deemed necessary as it is people who have specific experience in this area that can provide an insight into both underlying causes of delay and their relative effect. Sample of responded questionnaire is attached in Chapter 6, Table 6-6. The response rate was 100%.

The questionnaire respondents were asked to express their opinion for each delay factor as a percentage, were the maximum percentage representing the maximum severity of delay. The severity clarification used in the research survey results are as shown in Table 1-1.

**Table 1-1: Severity Weighting Scales in the Research Study**

No.	Severity Weight	Ranks	Scale	Scale Description	Note
1	Maximum severity	5	100%	Direct affect	Immediate delay
2	Very severe	4	85% and above	Always affect	Delay
3	Severe	3	65% and above	Often affect	Causes delay
4	Medium severity	2	45% and above	Sometimes but not always	Possible cause of delay
5	No effect	1	25% and above	Could be neglected	Minor delay
6	Never	0	0% and above	Ignored	No delay

The type of contracts used on the projects which were surveyed was of the traditional type, i.e. the terms and conditions of the contracts were extracted from “**FIDIC-1992**” Part I General Conditions and Part II Condition of Particular application.

In some projects the author had permission to visit the site to interview the Contractor’s Project Manager and complete the questionnaire during the visit. This ensured that there was no ambiguity in either the questions or responses and also facilitated discussion on wider issues relating to delays experienced by the respondent, particularly in relation to root causes of delays and how it may be overcome. The summary of findings of the survey thus provided some evidence as to the validity of the research and its objectives. From the existing literature of causes of project delays in the Gulf region, it was possible to identify the major variable causing delay and cost overruns. The questionnaire survey relates directly to the objectives of this research which is to identify the major causes of delay in construction projects and to assess the relative importance of these causes for the bill of quantities contract form the view point of the Consultants and Contractors.

#### **1.4.3.3 Case Studies**

The purpose of the case studies is to examine the occurrence, nature, responsibility and effect of the delays on construction projects in Dubai. The case studies analysed

the time and cost implications of the delay encountered, reasons, responsibilities, delay development process and possible solutions to such problems. The findings of the case studies form a basis for the comparative analysis with the theoretically predicted sources of delay, and the questionnaire survey results.

Both cases were major construction projects for which the author worked as the project manager on behalf of the Contractor. The author thus had full access to all contract documentation, and an intimate knowledge of the project execution. The results of literature review and questionnaire survey provided a useful benchmark for the case studies. The studies covered the whole lifecycle of the projects from the inception stage to handing over stages.

The case studies process includes planning, data gathering, analysing, discussion and improvement. The whole case study process lasted more than six months. It was conducted through means of documents collection and study, observation, group discussions and a workshop, and comparative analysis. The feasibility, design process, tender and contract documents, construction methodology and working programme were the factors which helped the author to do the analysis of both case studies. Vast amount of project data has been gathered which forms a solid base to make the comparative analysis.

The results of the delay was tabulated and compared with the findings from other chapters relates to the primary causes of delay. Through the examination of the practical records, events and manifestation of such problems, it has been found that the roles and the obligations of each project participant were not implemented to the satisfaction required level for handing over the project on time. This has revealed the actual causes of delay which could be divided into contractual, technical, financial and legal responsibility assigned. The types of delay in both projects have occurred due to lack of experience of the project administration staff in the principles and roles of design process and management and the construction management process. This provides a specific practical confirmation of many of the causes of the project delay that will be compared by the literature review and questionnaire.

Overall, the case studies provide the professional insight that will lead to the development of recommendation for the Contractor's Project Manager operating in U.A.E. to mitigate and reduce the occurrence and effects of project delays.

#### **1.4.3.4 Quantitative and Qualitative Analysis**

In order to digest and understand the overview and reach a coherent answer to the research questions, a coding and the tabular approach was used to analyse data gathered through the questionnaires and other sources of literature reviews. Tabulating and formulating the collected data will help to present the findings in more concise and detailed form.

##### **a) Quantitative Analysis**

Quantitative analysis was mainly used to analyse the questionnaire results. The severity clarification used in the research survey results are shown in Table 1-1. The questionnaire respondents were asked to express their opinion for each delay factor as a percentage, where the maximum percentage representing the maximum severity of delay. The ranking of value 5 is considered for 100% severity and value of 4 is considered for 85%, etc.

##### **b) Qualitative Analysis**

Qualitative analysis was mainly used to analyse the results of case study and compare the results with those from questionnaire and literature review. The aim of the qualitative analysis is to preserve and analyse situated form, content and experience of the action where actual discussions, talks, gesture and other issues are presented and discussed.

## 1.5 SCOPE OF STUDY

The author undertook this research to determine the major factors affecting handing over a project on time. The questionnaire and case studies were used to identify the major reasons of delays and to identify the elements of project delays. The fusion of the professionally gained experience of the author with the research methodology in Section 1.4.1 were used to formulate the factors of delays to establish the final resulting guidelines for the Contractors Project Manager to reduce project delays. The roles, responsibilities and the obligations of the parties involved in any construction project are clearly mentioned and stated under specific clauses in the conditions of the contract. The investigation of the analyzed two projects and the survey study was based on FIDIC type of contract, which is frequently used in Dubai. Particular attention was paid to the origin of a delay and its severity, this meant that delays which did not emanate directly from the Contractor had to be considered. While the Contractor's Project Manager may have no direct control over some of these items, he may still be in a position to liaise with the other parties in order to preempt or mitigate delays from these sources. This approach is compatible with the current "partnership" approach being promoted internationally in the construction industry.

**Scott S. (1997)** stated that *"There are of course, factors other than varied work that may delay the project, and it is also generally recognized that delays may be attributed to the Client, to the Contractor or to neither party"*.

As the two case studies are of building construction projects, any conclusions must be considered as being most relevant to this type of contract operating under the FIDIC type of contract. An argument can be presented as to whether the two case studies may not be "typical" contracts, but in a sense all construction projects are to some extent unique. Taken together with the literature review and questionnaire data, the case studies form useful supportive detailed evidence of particular delay situations. The author has been involved with many contracts in the Middle East, and in his experience, the majority of problems encountered in them were not typical and they provide a reliable insight into operational construction activities in Dubai.

## **1.6 PROPOSED CONTRIBUTIONS**

It is necessary to come out with the final “output” for the research once the major factors of the delay are determined for the projects in Dubai. For example, the causes of claims and disputes between the project participants will be determined which will make them always aware during the design process and operation of construction. This also helps the decision makers of the projects to assure that none of the listed factors are not considered and discussed deeply during the project progress.

Another useful “output” for the Contractor’s project manager is controlling the claim and avoiding them as much as possible. This could be achieved by raising the critical issues in advance during the necessary regular meetings and give an early solution suits all the involved parties. Understanding the reasons behind changes will assist in reducing the effects of claims. This will assist in keeping program changes to a minimum. The analysis of the historical records of the claims through case studies can provide an insight into past problems. Specific attention will be given to the Contractor’s project manager’s role at the advanced stage of the project especially on issues which are not under his direct control. This will increase the contribution of the project participants in investigating the issues needed to avoid any delay or any claims.

A short manual or a summarized handout of “FIDIC in UAE” which contains the terms and conditions of the contractual obligations of all parties explained briefly with a simple presentation was prepared and used as a guide to the project participants in Dubai. This manual provides a guideline for construction professionals about the unique situations of FIDIC in UAE and the gulf region and how to use them in this region. That manual could be always used by all participants either before signing the contract or before going to a joint meeting or even during the kick off meeting where all participants are attends.

The final important “output” is making the project participants fully aware about the differences between the contractual, technical, financial and legal issues during the design and construction. This will make the Consultant and Contractor more aware of how to formalize the Employer requirements once they understand the objectives

of the project in details. This could be achieved by preparing the requirements during the concept design development, detailed design development and the method statement and procurement of the project.

## **1.7 DISSERTATION RESEARCH STRUCTURE**

The dissertation research structure is compatible with the thesis structure shown in Figure A-1.

As stated in Section 1.3 of this chapter, the objective of this research is to establish useful recommendations, which if implemented by the Contractor's Project Manager could mitigate the factors relating to project delays in the construction of projects in Dubai. As a result, it is necessary to determine the critical factors affecting the project progress. The content of the information of this study is complicated by the fusion of traditional Islamic culture, with international working methods and procedures. Different procurement methods of construction projects, which relates to the different type of contract, means the Contractor's Project Manager is operating under unique and demanding conditions if he is to avoid and reduce project delays.

The study is prepared based on the major factors in the place of study (Dubai) and introduces the project types encountered and the roles of the construction industries in Dubai; this is covered in Chapters 2 to 4. Chapter 2, "Working Environment in Dubai", also explains the different issues between private sector projects and government projects in dealing with their objectives, organizations and policies to avoid any delays. The contractual relationship and procurement procedure of the projects in Dubai has also reviewed along with the Client, Consultant and Contractor obligations during design and construction. A literature review of the design management processes and contract procurement is also investigated to establish the responsibilities of the involved parties in the project.

The impact of cultural factors on the management of the projects was also undertaken to find out how the Islamic traditions, legislation, workforce, language and the foreign Consultants could affect the design and execution of the project. A questionnaire



survey was conducted to assess the perception of the Client, Consultant and Contractor to delay causation. Interviews were also conducted with construction managers to establish apparent reasons for delays in their particular projects which provided the opportunity to determine the actual root cause of project delay. The case studies for two major building projects will be analyzed to find out the actual causes of the delay and compare these reasons with the causes found by the survey. Based on the formulation of the delay causes found by the survey and the case study analysis, a comparative analysis will be made to establish recommendations for:-

- i. Actions that the individual major project participants need to address to reduce delays (Chapter 9).
- ii. How the Contractors Project manager can act to help minimize delays, with the cooperation of the Client and Consultant (Chapter 10).

## **1.8 SUMMARY**

The aims stated at the beginning of this chapter declared that it was the intention of the Author to identify the main causes of construction projects delay in Dubai and how the Contractor's Project Manager must act to reduce these delays.

This research is also prepared to find out the attitude of the project participants in achieving the completion date and to determine the factors of the delay in construction projects and the problems which cause the delays and the major recommendations to sort out the problems to avoid any delay.

Much information was collected during the study from many sources such as literature review, questionnaire survey and interviews where the literature review provided much information about construction and project management implications and the questionnaires provided the type and causes of the delay for getting the feedback from the respondents to determine the major delay causes.

Some useful information was collected by individual site managers through a separate interview to discuss some important issues in the questionnaires. Findings from the questionnaire survey and interviews are used as an indicator to the current situation

and the influence and actions that construction project managers can take to in reducing these identified causes of delay.

In general, to achieve the research objectives, the following methodologies were presented:

- 1) The sources and approaches of literature review,
- 2) The development of the structured questionnaire,
- 3) The process of the case study,
- 4) The completion of the quantitative research techniques which was conducted upon the results of the questionnaire survey.

--- End of Chapter ---

## **CHAPTER 2**

# **WORKING ENVIRONMENT IN DUBAI.**

## **2.0 INTRODUCTION**

*“Dubai is witnessing a very fast growth, it is becoming quickly as the destination of choice for tourists, residents and business with exceptional shopping and leisure activities, distinctive homes and unique opportunities” (Al Rais M., 1990).* This gave the opportunities to foreign Contractors to participate on the enormous impact in the construction industry. Opening the construction market to overseas Contractors had affected the construction industry negatively and positively. *“The construction activities started during the early 1960’s and as the years passed it had big development by building the construction projects and infrastructure projects” (Hani D., 1990).*

The Emirate of Dubai is one of the Seven Emirates in the United Arab Emirates located in the Arabian Gulf. In 1971 Dubai began to command the position of the commercial centre while Abu Dhabi became the federal capital. The growth and the economy were increasing gradually due to the flexibility of the commercial roles for the local and foreigners. New regulations and obligations was assumed for Contractors and Consultants to adhere them for maintaining the construction market increasing , but due to the lack of experience of many Contractors and Consultants some problems appeared and forced the government to issue new rules at least to control the real estate sector.

This section will cover in details a description for the local environment of Dubai where the research was conducted. It covers the roles and obligations of all local and foreign firms who are involved in the construction industry. Also, the author will investigate the affection of the multi-population and multi-manpower on the real estate sector and housing sector. The affection of the cultural factor of the manpower on the progress of the work in all projects has a major negative impact on many projects. This will be discussed in details in the next few chapters.

During the construction period, many different opinions often occur between all the main parties. These may be of a technical nature during construction period or due to a series of factors during design, which combine in various ways to produce

arguments, disagreements and ultimately delay. Some of these factors are basic to human interaction, such as the motivating factor of individuals, human behaviour, organizational behaviour, culture etc, what makes construction contract problem different is the unique nature of the project.

In trying to understand why delays occur in construction projects, it is important to realize that the whole process involves the interaction between parties with different primary objectives. Many problems are caused by the arguments about technical or legal issues, which in turn are based on design management principles, (this escalates when people become intransigent). To find out and reduce the causes of delays, the Design which interface with the construction stage, must be fully understood by the Consultant Designer and the Contractor's Project Manager. The approach to the design and construction of new projects has changed significantly over the last ten years. This is mainly due to the Client's expectation of improved performance from both Designer and Contractor and their expectation in final project outcomes. The Client also seeks greater control over their projects and an increased involvement in decision making. Therefore, this chapter not only introduces the general construction and building environment in Dubai, but also examine design management implementation.

## **2.1 LOCAL ENVIRONMENT**

### **2.1.1 Federation**

On the British withdrawal in 1971, Dubai came together with Abu Dhabi, Sharjah, Ajman, Umm Al Quwain, Fujairah and Ras Al Khaimah (in 1972) to create the federation of the United Arab Emirates. Abu Dhabi became the federal capital, while Dubai began to command the position of commercial centre.

This was shortly after the discovery of oil in 1966, which was soon to transform the emirate and its way of life. Dubai's first oil exports in 1969 were followed by a period of rapid development that laid the foundations for today's modern society. Much of the credit of this development are traced to the late Ruler, Sheikh Rashid bin

Saeed Al Maktoum, who ensured that Dubai's oil revenues, despite being relatively modest of the regional standards, were deployed to maximum effect.

His work was continued by the late Ruler, Sheikh Maktoum bin Rashid Al Maktoum, and still visible under the current Ruler Sheikh Mohammed bin Rashid Al Maktoum. The result is that Dubai is constantly building up its infrastructure of transport facilities, schools, hospitals, tourism developments and other amenities of an advanced society.

Commercial success allied to the liberal attitudes of Dubai's rulers, made the emirates attractive to traders from India & Iran, who began to settle in the growing town. Dubai began to command the position of commercial centre.

### **2.1.2 Economic Growth**

Thirty years after the United Arab Emirates (UAE) was created from a federation of seven individual Emirates of the Gulf Coast, as a single sovereign nation, Dubai has emerged as the Country's Commercial Capital with Trading & Business ties extending to all parts of the world. Three decades after the founder of the U.A.E., H.H. Sheikh Zayed Bin Sultan Al Nahyan, President of the Country. The country population has grown from a few hundred thousand to nearly Three Million (**Rami M., 2002**).

In less time than it took a medium-size European or American community to establish itself with a permanent residential population, commercial, economic and civic base, Dubai has transformed itself from a small ocean borne trading hamlet on the edge of harsh desert into a cosmopolitan city with a distinctive cultural blend of old meets new and East meets West. It is also at the centre of the Middle East, one of the world's fastest growing economies.

Dubai covers an area of 3,900 square kilometres and is now the biggest single entry port in the Middle East (**International Information Guide, 1987**). Thanks to its low logistical and operational costs and excellent infrastructure, international outlook and

liberal government and trade policies, investors are attracted to Dubai in rapidly increasing numbers.

The Emirate's long-term development goals are to sustain high-income levels and further strengthen the region's economic diversification process. *"The Government's vision for Dubai is to sustain economic dynamism, quality of life and regional co-operation and integration. Trade, transport, tourism, finance and manufacturing have all shown steady growth and helped the economy achieve a high degree of expansion and diversification"* (Al Kenddie S., 1996).

Today, Dubai is the second largest economy of the seven emirates making up the UAE and is less than eight hours away by air from many of the world's leading cities. It is also a major trading port for ocean-going vessels from around the world.

Following the Second World War, the search for oil throughout the Middle East intensified. Oil was discovered in Dubai in 1966 and the first exports followed two years later (Farsi, 1990). Alrais M. (1990) stated that *"The discovery of the oil in 1966 played a significant role in developing the economy of the Emirates and attracting investors. Oil is nevertheless second to trade in the composition of Dubai revenue."*

The Ruler, Sheikh Rashid, ensured that this oil wealth was deployed to maximum effect, laying the infrastructural foundations for the ultra-modern city we know today. His vision also resulted in the construction of the 35-berth Port Rashid in 1970, followed by construction nine years later of Jebel Ali Port, the world's largest man-made commercial port.

More than 100 square kilometres of land adjacent to the port was mapped out as a free trade zone, and this quickly attracted regional and international business. The Jebel Ali Free Zone provides for 100 percent foreign ownership, 100 percent repatriation of capital and profits, no corporate taxes for 15 years and no personal income taxes.

*“Construction of an international airport was also high on Sheikh Rashid’s priority list, and by the early 1980s Dubai boasted one of the biggest and most modern air terminal’s in the Middle East” (Haron S., 1990).* Those buildings of 20 years ago today form the basis of the expanded and refurbished arrivals and departures that serves the new Sheikh Rashid Terminal.

*“By the time Dubai’s 39-storey World Trade Centre was opened in 1979 to house the regional headquarters of many of the world’s largest corporations, the city had adopted a new secondary name - ‘the banking capital of the UAE’ - with 126 banking outlets (nearly 70 percent of them national banks) and nearly 80 foreign exchange houses now located in the city” (Jawdat F., 1998).*

In addition to a world-class airport, Dubai now has a world-class tourism infrastructure, with more five-star city hotels and beach resorts per capita than any other city in the region - and yet more planned in the first years of the new millennium. These developments have meant a major and continuous investment in wide range of Construction Projects.

*“The climate of Dubai is characterized by a hot humid summer starting from June until mid of September. Winter is warm with little rainfall; it starts from December till the end of February” (Al Rais M., 1990).* The weather is generally pleasant from March till November (45<sup>0</sup> degree). The climate offers a challenge to both Designers and Contractors due to the large temperature range, high humidity and salinity, strong solar radiation also presents difficulties to Contractors as results of often unpleasant working condition.

Dubai has experienced extraordinary economic growth. It was the first city in the region to form free trade zones two decades ago, and foreign investors have not been shy in setting up their regional operations here. Beyond trade and manufacturing, this now extends to the free trade zones of Dubai Internet and Media cities (and shortly Medical city), giving the emirate a cutting edge technology advantage. Meanwhile investment in tourism has grown by leaps and bounds. With over 50 four and five star hotels in the city, tourism revenue overtook oil revenue as a part of Dubai’s gross



domestic product (GDP) for the first time in 2003–18% of GDP against 17% GDP for oil; Dubai's GDP increases an average 7.5 % a year according to official figures.

## **2.2 BUILDING & CONSTRUCTION INDUSTRY IN DUBAI**

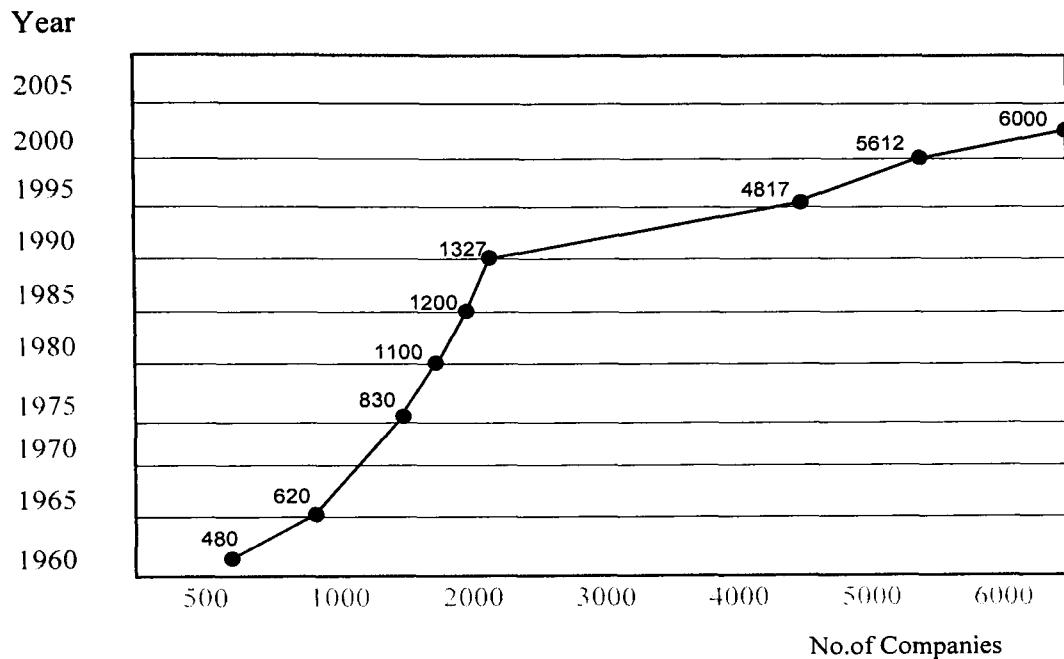
*“The Dubai early industrial development was mainly geared to construction support, but by 1986 most of the major projects required for the national infrastructure had been completed and priority was switched to consumer goods and other import substituting industries” (Ahmad S., 2003).*

Dubai has a small population and therefore the internal market is limited, thus the emphasis of light and medium industries is being increasingly directed to exports. The contracting sector undertook the construction of all governmental facilities, ministerial buildings, roads and flyovers and the building of residential facilities and services. The contracting sector is without doubt an important element in supporting the state economy in general.

The nature of construction functions and projects require dealings between governmental and private bodies. Such bodies deal directly with the Contractors, following their own systems and regulation which at times are complicated when the project requires dealing with more than one body, because the regulations of these bodies may not line with each other. The governmental and private authorities deal with the contracting companies in the context of regulations, which evaluate and classify companies into categories. For example, the classification of these companies is done with the Dubai Chamber of Commerce and Industry according to their capital only. Under such classification companies are divided into five categories. But the tender board divides them differently, based on the capitals, in addition to other conditions related to the technical and administrative bodies, Contractor's equipment and practical experience.

There was a very big increase in the numbers of Contracting Companies between 1990 and 1996 in Dubai. There were more than 6,000 Contracting Companies in 1996

whilst the number was only of 1,327 in 1990 (Dubai Commercial Directory, 1996). Fig. (2-1) illustrates this striking growth between year 1990 and year 2001. .



**Fig. (2-1) Number of Contracting Companies from Early 1960s to 2002 in Dubai.  
(Dubai Commercial Directory, 2006)**

The Dubai Chamber of Commerce and Industry in co-operation with Dubai Municipality classify Contracting Companies in Dubai. Construction companies are classified as five levels in Dubai. The levels depend on manpower, previous projects, capital of the company, nationality of the company, available equipment and plant of the company, general experience of the company in all types of projects and the age of the company. The fourth and fifth levels represent two thirds of the total numbers of these construction companies. This means that the majority of contracting companies working in Dubai are too small to play an important role in the field of construction. One third of contracting companies are in the first and second categories which have the ability to construct the large projects founded by the Government and reputed Clients.

When the construction activities started in the early 1960s, the Government allowed all foreign Contractors to participate in the construction of large projects, especially

the British & Americans, which are the leading countries in infrastructure & building works and most of them were classified in the first and second category.

Dubai has experienced a massive development programme that started from a very low infrastructure level. This development process has been accomplished in record time. Playing a leading role since the early stage of development, the construction sector has almost completed the new infrastructure of Dubai, which comprises of paved roads, housing complexes and other building, electrical networks, international airport, Government premises and many other buildings.

The economic development has led the extensive use of expatriate labours in all fields, to provide basic services and the necessary infrastructure, which the country lacked. The available local force was unable to cope with the economic developments and result was an inflow of foreign manpower in large number of join all sectors and in particular the building and construction sector and to meet growing demand for services and projects.

Numerous projects have been announced in 2002-2003, which are designed to place Dubai among the top destinations for business and stimulate economic growth. It has an ambition to become the cynosure of the world's eyes. Massive and trend setting projects have been launched by the Emirates in its bid to be recognised as leading centre for tourism.

The Palm, a \$3 Billion residential and tourism project, is among the latest examples of this and follows a line-up of outstanding new projects such as the \$2.5 Billion expansion plan for Dubai International Airport, Dubai Marina, Souk Al Nakheel, Bur Juman Centre expansion, Emirates Hills, and several others.

Dubai has also gained the distinction of having been the venue for Dubai 2003 World Bank/IMF Summit in September 2003. The Dubai World Trade Centre has launched a massive expansion to host the event, which entails constructions of a new convention centre. A number of hotels were also scheduled to open in time for the event.

The Dubai Shopping Festival (DSF), over the past seven years has given considerable impetus to the economy and the tourism sector of Dubai, so much so that a dedicated Festival City is being built. The Dubai Festival City is aimed at transforming the city and enhancing its touristic appeal.

In line with these developments, the emirates continue to boost their infrastructure to cope with the burgeoning number of tourists and the growing population. Another ambitious project is the proposed railway project for Dubai which is aimed at relieving the congestion on the roads. Though still in this nascent stage, the project aims to eventually link up the UAE Emirates.

Given this significant number of major projects, construction activity in Dubai continues to expand. New developments focus on higher quality, not only in the type of construction materials but also in design for an upscale lifestyle.

## **2.3 DUBAI REAL ESTATE SECTOR**

During the last two decades, Dubai witnessed remarkable growth in its economic and social development pattern. These positive developments have played a significant role in placing Dubai as one of the leading commercial and industrial centres in the region. The major economic changes had a positive impact on the social development and in elevating the living standard of Dubai Citizens. Major social development projects were established by both sectors (i.e. the Government & the Private), which include housing projects, hospitals, schools & educational institutions and other utilities. The fast growth in these areas has attracted more rapid investment in construction covering commercial centres, housing schemes and other related servicing projects. The following are the major factors which have resulted in the appreciation of real estate value:

The growing need to accommodate the fast growing population of Dubai which have increased from 70 Thousand inhabitants in 1968 to 183 thousand in 1975 and rose sharply in 1980 to 276 thousand and 419 thousand in 1985 (**Statistical Book, 2004**). It is expected that the Dubai population will double by the year 2005. The population

growth in Dubai is considered to one of the highest in the world. The increasing trends in the population growth have necessitated the construction of large residential projects in various parts of Dubai by both the government and private investors. These initiatives have played a significant role in solving the accommodation problems witnessed in the emirates during the economic boom period in the 60s and mid 70s. The expansion of real estate had also created stable rates for rents.

The prominent factor, which has also stimulated the real estate market, is the growing foreign trade activities. Dubai's total trade has increased from Dhs.9 Billion in 1974 to Dhs.20 Billion in 1978 and rose sharply in 1980 to reach Dhs.37 Billion and Dhs.62 Billion in 1995 (Statistical Publication by Dubai Chamber of Commerce, 2004). With the view to meet the requirements of business establishments for office space, showrooms, warehouses and employee's accommodations, the private investors implemented major commercial centres and residential projects.

Beside the fast growing trade activities, the manufacturing sector growth during the 80s have also stimulated the real estate market for industrial plots as well as commercial and residential needs of over 265 industrial establishments operating in Dubai.

The tremendous positive changes in Dubai's economic and social structures have lifted the people's standard in living. All these factors have added more to the value of real estate in Dubai which can be classified into four distinct categories:

- 1) Commercial Estates
- 2) Industrial Estates
- 3) Agricultural Estates
- 4) Residential Estates

During the last decades, Dubai's real estate market has shown an active trading, which is handled by the nationals and companies totally owned by nationals. Accordingly, the market value of all real estates has appreciated substantially.

Foreign labour forces were engaged in Dubai construction industries. The main source of the foreign labour force comes from India, Pakistan, Thailand, Korea and

Bangladesh. The main reason behind bringing this source of labour force is the low labour cost and their ability to work in the Dubai weather conditions, especially hot summer climate. It is important to note that the construction industry demands highly skilled workforce and even the developed countries find difficulties in providing sufficient skills, especially during boom periods. The West can cope with shortage of skilled manpower by intensive training programmes and importing skills from abroad.

However, **Al Sharqi N. (1994)** confirms that *“The Dubai construction industry could not respond to the demand of skilled workforce, because of:*

- a) The sudden occurrence of the economic development,*
- b) The size of economic development was too big, compared to the size of the country,*
- c) Limited human resource at the time of economic boom, both in quantitative qualitative terms, and*
- d) “Lack of experience in dealing with economic cycle (boom and recession)”.*

The manpower of the construction industry, both Main Contractors and Sub-Contractors, has increased during last two decades. Since 1990, there are more than 380,000 labour, skilled and unskilled, employed by Main Contractor’s and Sub-Contractor’s.

According to **Al Hammaddi S. (2005)**, *“The approximate number of the total manpower (skilled and unskilled) who currently registered in the labour office in U.A.E. are 485,000 labourers employed by Main Contractors and Sub-Contractors organizations which are registered in U.A.E. Chamber of Commerce (Abu Dhabi and Dubai branches)”.*

### **2.3.1 Land Department**

To organise the rapid development in Dubai real estate sector H.H. Sheikh Rashid bin Saeed Al Maktoum, the Ruler of Dubai issued a decree establishing the Land Department in 1960. The Land Department is entrusted with the regulation and registration of property in Dubai. Specific clause was stipulated relating to every

aspect of Land registration and to the proper delimitation of boundaries and the transfer of title deeds. Special committee was set up as arbitrator in disputes concerning gifts, inheritance and relinquishment of estates with no heirs, mortgages and outright sales.

### **2.3.2 Building Regulations**

In order to regulate the Construction activities in Dubai, the Municipal Council issued the construction ordinance in 1975 (Dubai Commercial Directory, 1980). It incorporated construction licensing conditions, documentation, construction designs and method of supervision. Classes of buildings, zones and minimum of land required for construction a building in Dubai Emirates were also stipulated. The ordinance of regulations incorporated detailed technical and engineering studies for construction in residential, commercial, multi-storey buildings and in the industrial areas safety connections, car parks, water drainage connections, wastes and rain water drainage, water and electricity connections provisions were also stipulated. Construction regulations were meant to develop a well-planned and modern city with safe reliable facilities.

### **2.3.3 Real Estate Development**

The last ten years have witnessed an increasing trend in the construction of property including houses, residential estates, industries properties and commercial centres. The latest building survey conducted by the Ministry of Planning in December 1996 showed that the total residential buildings in Dubai reached 78,035 units.

Based on the building survey conducted by the Ministry of Planning, the following administrative zones of Dubai Police Department are defined:

- 1) Naif Zone: Incorporating Al Rasauea, Al Soaque, Al Kabeer, Nasser Square area, Al Shemal, Al Sebkha, Al Marar, Naif North and South, Al Beteen, Al Nakheel and the area following between Al Maktoum road and Bin Yas road and starting from the Land Department and Etisalat Building.

- 2) Muraqqabat: Covering Al Riqqa, Al Hamriya, Abu Hail, Hor Al Anz, Al Safiya, Al Bateen, Al Khubasi, Al Daraha, Burj Nahar, Dubai-Sharjah, Al Tawoon Bor Saeed and Al Garhoud.
- 3) Al Ghusais: Covering Al Ghusais, Al Ghusais East and Al Mezhar.
- 4) Al Rashidiya: Incorporating Al Rashidiya, Al Ramool, Murdif and Mushrif.
- 5) Al Rufah: Covers the areas of Shindaga, Al Souq Al Kabeer Dubai, Al Rufaah, Al Diwan, Hamriya Dubai, Al Baloosh and Al Baharna.
- 6) Bur Dubai: Incorporates Zabeel, Al Jumeirah, Al Safa, Al Gouz, Boadah, Defence Road area, Umm Sequaim, Jebel Ali, Al Satwa, Al Karama, and Al Kifaf.

According to **Fathi M. (1997)**, *“the Public Residential Units reached 11,070 the most important among them are: Hospitals, Schools and Educational Institutions and Hotels. A lot of building constructed in Dubai at the end of the years 1995 reached 80,300 units spread all over Dubai”*.

During 2000 & 2001, Dubai has witnessed an increasing activity in construction sector. This trend was created by the improving economic and trading activities, resulting in fresh demand for residential units, shops, warehouses, showrooms, etc. In the year 1996, about 3,102 commercial, residential and industrial units are completed and approved by Dubai Municipality.

According to **Moh'd E. (1997)** *“Real Estate Development in Dubai is governed to a large extent by the growth of Trade and Industry activities and the overall pace of economic and social development. The Construction of a factory or establishing a new commercial ventures create a need for offices for business operations, accommodation units for the staff and other social services. The present high demand for residential units in Dubai could be attributed to the following facts:*

- 1) *The noticeable increase had taken place in the commercial activities in Dubai during the year 1994 / 1997. The value of Dubai foreign trade has increased during the year 1997 by 23 percent.*



- 2) *New investors from the AGCC Countries and Iran are operating business activities from Dubai.*
- 3) *Jebel Ali Free Zone has attracted more investors during the last five years. This trend gave rise in the demand for flats and villas to accommodate the employees of those units operating in Jebel Ali Free Zone. Presently, there are about 315 Industrial & Commercial Companies operating in the Free Zone and the total employment in the zone is estimated at 5,300 employees.*
- 4) *The newly constructed Residential & Commercial units have provided additional and attractive facilities. These have induced some of the occupants to shift to new premises.*

*The law of demand and supply governs rent rates in all cases. It is expected that rent rates will tend to rise with a moderate decline in beginning of new century after the completion of the large number of buildings under construction”.*

Dubai is constantly building up its infrastructure of transport facilities, schools, hospitals, tourism developments and other amenities of an advanced society by adapting Free tax Strategy. There are currently no income or property related to taxes of any kind. Government of Dubai is committed to liberal, free market policies and to a creation of business environment conducive to a commercial activity. This approach is well illustrated by incentives available to investors in the Jebel Ali and Airport Free Zones and by continuing high level of private sector investment in properties. Any investor, overseas or resident can purchase in Dubai's Luxury property.

#### **2.3.4 Housing & Occupancy**

The high rate of occupancy has induced a number of investors to channel their resource towards residential buildings and other construction schemes during the last seven years.

The housing market in Dubai has increased rapidly by allowing the foreigners to purchase lands/property and build their own house. Many properties have been occupied by the foreign investors and real estate companies who have the partnership with local construction companies and started developing the projects. Many points

was not considered by those new Investors/Clients who are working outside their usual area of business, perhaps with a different partner in different parts of the globe means that additional risks such as those related to traditions, cultures, work forces, local sub-contracting and lack of knowledge of the local codes, laws, regulations etc. Multiply to present a greater risk that has to be worked with. Working on new environment means that the experienced Clients, their representatives, their Designers, Project Managers and the skilled human resources will be working in unfamiliar place which will cause a major problem to them of not getting their projects built on time. This is the negative part of allowing the foreign investors to invest their resources in the housing market in Dubai.

When the complexity of a modern airport or a hospital building is compared with that of a housing development, it is clear that the contractual issues are completely different. For example, delays in the supply of information will be reflected negatively on the site condition. It is interesting to note that the **Banwell G. (1964)** recommended that *"the Building industry should develop and use a single standard form contract for all construction projects"*. **Latham M. (1994)** stated that *"This idea should be considered and further steps should be taken to apply the New Engineering Contracts as the universal standards for the entire industry"*. It is not unrealistic to standardize the Building contracts in Dubai due to the differences in technological complexity and type of Client. Clearly, due to rapid growth of housing development in UAE specifically Dubai, there is a need among Clients and Contractors for different contracts to suit different situations to avoid any delay or any Contractual conflicts.

## **2.4 DESIGN MANAGEMENT IN DUBAI**

Design is a complex process, which continues to increase in complexity because of the dramatic increase in specialist knowledge and available methods of computer analysis. There are now many contributors to the design of a project from a wide variety of organizations. This gives rise to a design process, which consists of a continual exchange and refinement of information and knowledge.

As a consequence, building design has now become an integral part of a complex industrial process and there is a need to identify the management task and to manage it effectively. Therefore, it is necessary for the Designer and the Contractor, to manage and coordinate the design process and construction procedure's, noting that the involvement and approval of the Client or his representative is necessary if delays are to be avoided.

In Dubai, the design characteristics in some consultancy offices are controlled and always monitored and achieved while it is limited in some others. The lack of coordination between the specialists produces improper comprehensive documents. Many of the design managers and coordinators do not maintain the phases of the interaction between the major design phases. Lack of experience of getting the correct information during the briefing stage reflects the quality of the furnished information to the design team. Scheme design and detailed design will be produced with many mistakes and errors because the final design concept was not clear. Design coordination is always missed and the concept of the Value Engineering is also not followed because of the lack of the resources, the lack of the staff experience, the load of the work and the lack of coordination.

In all situations careful integration of the design process with the procurement and construction of the project is of paramount importance. However, for the efficient provision of the design information, it may be necessary to subordinate the concerns of individual organizations to the demands of the project as a whole. Good design management helps designers to focus on the project needs and to be aware of the controlling activities. In practice, each member of project team, which may consist of Consultants, Specialist Trade Contractors and Project Managers will carry out a design management function, which should be controlled by a manager from within each organization. There has to be a single point of responsibility, however, on any project for the final delivery of the production information approved for construction. The responsibility for this should be decided at the outset and the appropriate authority established.

Two issues should always be addressed: the provision of accurate, fully coordinate and complete information, and the timely provision of the information. The first issue

is the responsibility of the lead designer and the second is that of management. Ideally they should be synonymous, but the complexity of the management task now requires that it is identified as a fundamental need in modern projects and vested in individuals or organizations that are experienced in, and understand, the integrated process of design and construction.

According to **Hughes G. (1996)**, *“The design as it is being developed, should be evaluated to ensure that it produces value for money, simplicity of construction and long term satisfaction in operation”*.

To achieve the above statement some principles & basics techniques of planning, monitoring and control appropriate for managing the specific requirements of the design process must be considered by the three involved parties during design and execution. Agreement at this stage is a good strategy to limit future sources of delay.

#### **2.4.1 The Process of Building Design**

Design is a creative and a very personal activity. It is important, however, to understand how designers think when defining and realizing their objectives and their respective priorities. Only when the design is complete can the result of their intense intellectual activity be seen. This is at the heart of the problem of managing design. It is why Managers need to understand the methods by which a typical design is developed, and the characteristics of the designers, so that a level of understanding is achieved which allows them to become sympathetic to the process.

In essence the architect takes the Client's brief and uses design skills to develop a three-dimensional interpretation which other designers use as the basis for their own work. This is not a hard and fast rule, as on any project the formative or concept design stage is both interactive and iterative between the many design disciplines as well as between the architect and the Client. The designer or the Consultant designer must think about the buildability of his design by having a very efficient and creative solution to any problem while execution. This must be coordinated with the specialist Sub-Contractor during studying the internal and external design constraints. New ideas must be generated in co-ordination with client representative complies with the

project objectives suiting the buildability of the project and these ideas must be supported by drawings in full details to help the Contractor understanding the design subject while tendering to avoid any delay or any dispute later on.

The Consultant should be fully aware of strategies for solving problems in design as well as the implication of managing this design for avoiding any interface while construction.

#### **2.4.2 Rates & Responsibilities**

Each work activity in Construction will be based on the approved detailed drawing, which itself is based on the developed prepared brief, conceptual and scheme design. At this stage the design team, specialists and Client representatives must be involved and aware of all technical aspects because at this stage the type of procurement may well be based on the approved details. This is the reason why design management & procurement choices are inter linked, and can affect later stages of the Project.

#### **2.4.3 Managing Design Process**

While the drawings and bill of quantities are being processed in line with the Procurement Contract type selected, the Consultant has to manage his design to make sure that no failure will occur that will impact on construction. The design staff must be organized and they have to be familiar about how to prepare agreements and how to judge the level of Contractor's involvement. Creating a good working atmosphere and keeping good internal relationship between the staff of each organization and of each section in the project will create a spirit of cooperation and guarantee an empathy with the succeeding construction process.

To limit future delays the Consultant must liaise with Client while preparing the design and arrange a co-ordinated briefing process to understanding the Engineering aspects of the design, making sure that all required information is complete and is compatible with drawings issued.

Periodic Evaluation of information is necessary during design management. Such as, design review, component specifications, value engineering, project buildability and life cycle costing. This improves the probability of limiting any subsequent revision of design, which would impact on the construction stage and hence reduce sources of possible delay.

#### **2.4.4 Planning, Monitoring & Control**

Planning the design activity is fundamental to design management. A different approach must be considered for each stage of the design. At the out set there is a need for strategic overall plan which considers all stages of the works, the interface to the construction process and the input of the key contributors to the design, including the work Specialists, Contractors and nominated Subcontractors.

Meantime when planning is finalized with Contractor and Client, a Procurement Schedule has to be prepared, noting that any changes or variation must be considered or controlled through a proper procedure so as to avoid problems which could lead to a major delays point in future.

#### **2.4.5 Successful Design Management**

It is important to understand the essential structure of the design process and design problems and how it affects the work progress in construction projects. Stages of the design have to be achieved for good management together with meeting Client requirements and project buildability.

The following elements are important in reducing the occurrence of the problems with the Client or Contractor in the tender and construction stages (Table 2-1, from Gray C. (1996)). *“If the design group successfully address the following issues, 80% of potential construction problems can be significantly reduced. This will improve the construction performance and reduce delays”* (Hughes G. , 1996).

**Table 2-1 Issues to be Addressed in the Managing Design Process**

Understand the Complexity of the Design	<ul style="list-style-type: none"><li>▪ Define the sources of the design</li><li>▪ Define the technological content</li><li>▪ Define the maximum level of technological innovation</li><li>▪ Make sure the design is correct</li><li>▪ Get the special appropriate designer</li><li>▪ Understand method of design, why it is used</li></ul>
Manage the Designer Selection Process	<ul style="list-style-type: none"><li>▪ Understand the Client's requirements</li><li>▪ Select a group based on the experience of similar projects</li><li>▪ Divide a team for each design stage</li><li>▪ Check the resources of the design team</li><li>▪ Make sure that project objectives are very clear to design team</li></ul>
Recognize the Changing Design Leadership Role as the Design Progress	<ul style="list-style-type: none"><li>▪ Establish the individual design stage</li><li>▪ Identify the appropriate lead designer for each stage</li><li>▪ Identify the transition between scheme &amp; engineering stage</li><li>▪ Focus the Engineering stage on the production information</li></ul>
Integrate Information Supply with Construction Needs	<ul style="list-style-type: none"><li>▪ Supply information to meet the construction schedule</li><li>▪ Supply information to meet the early procurement schedule</li><li>▪ Supply information of meet the needs of Suppliers &amp; Fabricators</li><li>▪ Supply information to meet the users specifications</li></ul>
Obtain Agreement at Key Decision Point	<ul style="list-style-type: none"><li>▪ Define the stages of the Client decision process</li><li>▪ Package information to meet the Client decision points</li><li>▪ Sign off packages of information at each Client decision before proceeding</li></ul>
Manage the Integration of Contributions	<ul style="list-style-type: none"><li>▪ Align the objectives of all design contributors through start-up meeting</li><li>▪ Mutually plan all contributions at each stage</li><li>▪ Achieve awareness and understanding in each contributor task</li><li>▪ Establish the information and decision needs of each contributor</li></ul>
Re-plan to Avoid any Doubts	<ul style="list-style-type: none"><li>▪ Reduce a strategic plan for all contributors to meet the information need</li><li>▪ Identify mile stones for information assembly at key decision point</li><li>▪ All contributors to agree on information transfer schedule</li></ul>

	<ul style="list-style-type: none"><li>▪ Identify and plan information transfer between specialist Contractors</li></ul>
Manage the Interfaces	<ul style="list-style-type: none"><li>▪ Breakdown the work into zones</li><li>▪ Each zone must provide a complete piece of the project</li><li>▪ Identify all information to achieve full completion of the zone</li><li>▪ Identify in all specialists subcontracts the information needs and supply demands to achieve their design contribution</li></ul>
Control Design Development	<ul style="list-style-type: none"><li>▪ Don't change the basic design</li><li>▪ Identify the needs of specialist information and procure it early</li><li>▪ Obtain all design contributions for zone prior to commencing detail design</li><li>▪ Zone's lead designer to check all drawings for coordination and technological compliance before issuing for construction</li></ul>
Agreement	<ul style="list-style-type: none"><li>▪ Use standard design agreements as the basis for procurement</li><li>▪ Ensure agreements provide back to back cover</li><li>▪ Ensure agreements cover management responsibility</li><li>▪ Ensure collective responsibility for quality of information supply</li><li>▪ Ensure collective responsibility for timing of information supply to meet the construction needs</li><li>▪ Inform the Client or his representative for each step in details</li></ul>

## 2.5 SUMMARY

Dubai's economic development was associated with the discovery of oil in many areas of the country, which made it a focus for construction work. When Dubai developed into large commercial port in the Arabian Gulf, it gave the country increased economic importance.

From the above, the importance of Dubai as a trade centre is established, and the government policy of attracting new ventures in firms of new industries / factories and assembly plant is a further supplement to the boom which is evident at the present stage. These all contribute to the increase for new space expected from the construction industry and have created the environmental factors affecting it.



Design management is one of the most important items for project success and they have to be prepared properly to avoid any conflict with the construction stage. Understanding the design process and management techniques in detail will reduce the level of risk in delay. Major co-ordination is required between the three parties involved in the project i.e. Client, Consultant and Contractor. Recognizing the tools, processes and actions for the improved management of the design process is a part of an integrated system, which provides a total quantity approach to the management of design.

Selection and briefing of the design team will lead the team to prepare a detailed checklist to enable them to develop their analysis based on the Client's requirements. Also through the appointment of specialize Sub-Contractors, to deliver a proper package for the Client that can produce a project on time with minimal delays or disputes. The design as it is being developed should be evaluated to ensure that it produces a complete information base so as to provide cost effective and simplicity in construction and long term customer satisfaction.

--- End of chapter ---

## **CHAPTER 3**

# **THE IMPACT OF CULTURAL FACTORS ON MANAGEMENT OF CONSTRUCTION PROJECTS IN DUBAI**

### **3.0 INTRODUCTION**

This chapter presents the culture background of Dubai and the impact of cultural issues on the performance of multinational construction projects in Dubai.

The growth of the construction industry in Dubai, has led to many international Contracting Companies and Design Offices established. Some of those firms appoint a local Contractor's Project Manager to run the project for reasons which will be explained later in this chapter, and some prefer to have their own Contractor's Project Managers be familiar in the company roles, company policy and procedures. This means that the managers increasingly have to deal with individuals from other cultures and should develop their interactive skills to tackle such problems.

Foreign Contractor's Project Managers and local Contractor's Project Managers do not have same way of thinking but both have the same target (which is handing over the project on time). Because of their different cultural backgrounds, they have different behavior, belief, attitude and values, which reflect how they run the project.

The Contractor's Project Managers need to know how to deal with individuals such as the Client, the Consultant, the Contractor, local authorities and the other organizations who are from other different cultures. He must also understand and develop the communication skills, leadership skills, interpersonal skills, flexibility and the technological skills to overcome all the problems.

The Contractor's Project Managers who are unable to deal effectively with the society or environment where they are working in, due to multi-cultural factors or differences in legislation should be aware of the implications of the cultural differences and essential aspects of management and execution skills to avoid project progress delay.

### **3.1 DEFINITION OF CULTURE**

**Hofstede G. (1984)** stated that *“The most suitable definition of culture could be introduced as the entire heritage of a society transmitted by word, literature. It includes all traditions, habits, religion and language. More recently, culture introduced by Hofstede is the collective programming of mind which distinguishes the members of one human group from another. Culture in this sense includes system of values and values are among the building blocks of culture”*.

### **3.2 HOW CULTURE AFFECTS ENGINEERS BEHAVIOUR**

Cultural background has always a major effect on work and human behavior along with project progress. The construction industry is still suffering from many problems caused by cultural factors.

Culture reflects the human aspects of the engineering environment, it consists of beliefs, moral, habit and customs learned from others regardless what education individuals received. Some rules should be established on how one should behave when individuals from different societies work together in the design and execution of construction projects. A diversified society usually means different cultures. When analyzing different cultures, it is found that the personality of the Contractor's Project Manager is affected by the common elements such as family traditions, responses to change, level of education, understanding religion, level of culture adoption and level of understanding communication aspects. Those elements directly affect the project effectiveness. In each project, there are three main parties involved (i.e. the Client, the Consultant & the Contractor); each of them is affected culturally and this will impact on effective decision making, which in turn will impact the project progress in terms of time, cost and quality.

### **3.3 NATIONAL CULTURE DIFFERENCES**

According to **Hofstede's** study (1994) on value system for national cultures in more than fifty countries, there are four dimensions of culture value: power distance, uncertainty, individualism and masculinity, By applying these four dimensions in project management domain, it can be seen how project progress is affected by culture issues in Dubai.

- 1) Power Distance:** This dimension deals with the issue of human inequality and how power is resolved within different groups. Within the project environment, this is generally evidenced in the superior - subordinate relationship.

In Dubai the measure of power distance between Contractor's Project Managers (local or foreigner) and their subordinates is very high because subordinates are always expected to agree or obey the boss's orders. Another factor is the salary; there is a wide salary range between the top and bottom of organization. Also centralization is very popular between the Contractor's Project Managers and their subordinates, the employees are afraid to express their disagreement with their Managers. **Sayles L. (1989)** stated that *"when subordinates are consulted about and contribute to the change process, many benefits accrue"*. There are many points which affect the progress of work due to the factors of high power distance which is not easy to change because these habits have been ingrained from family, school, tradition and work place.

- 2) Uncertainty Avoidance:** It refers to the extent to which the members of a culture feel threatened by uncertain or unknown situations. This feeling is expressed through nervous stress and a need for predictability. In general, the Site Engineers, Project Engineer or the Site Staff are always afraid of their Contractor's Project Manager or the Consultant. This is because of the language, communication and cultural factors which make them uncomfortable in an unfamiliar environment. They believe that the company's rules should not be broken which in turn makes them reluctant to suggest, share thinking, and complain to senior management.

This of course creates a gulf between the site staff and top management, which contributes to the problems during the construction stage, in terms of factual reporting and developing a proactive management approach.

- 3) **Individualism:** This dimension looks at the relationship between the individual and the collective and since the groups of the Arab Engineers working in construction of project exceed those of Foreign Engineers, it means that they are more collectivist. Collective interests are always prevailing over individual interests. This indicates that conflict opinions are always controlled because they come from one environment who have common cultural factors.
- 4) **Masculinity:** Men and women are different; this is a fundamentally biological fact which different societies treat differently. The question raised is whether the biological differences has an effect on the work value. Since this study is about Arab country, Dubai, there are Sharia Law, traditions, and a rule for the working women in the construction management. Therefore it is very limited for women to work in this environment. This is a part of the culture, which is affecting the project progress indirectly.

Finally this certainly leads to the conclusion that managers and engineers cross cultures should look very closely at what motivates engineers working under them and with them.

### **3.4 THE IMPACT OF CULTURE FACTORS ON THE MANAGEMENT OF CONSTRUCTION PROJECTS**

Dubai is a multicultural environment; and historically many disputes and contractual problems remain even after projects being handed over to the Client because of cultural factors not being considered during the design or execution stages. Therefore it is very important for each and every Engineer who works as the Client's representative in private or government sector, the Consultant or the Contractor to concentrate and understand the following key influences:

- 1) **Law of Sharia:** It is essential to consider the impacts of religion because the law is based on religion. In some conflicts during execution, the Contractor's Project Manager may not take action the cultural behaviour of any of the project participants. This is because the traditions are influenced by Law of Sharia where forgiveness is required prior to any action. This has to be considered while raising or discussing any problems.
- 2) **Mixing of Nationalities:** The work force employed in projects in Dubai is always of mixed nationalities. This means a lot of traditions, rules, habits linked directly to the religion such as, the holy Friday for Muslims, the Sunday holiday for Christians, regular holidays and festivals for Indians and the different traditions of others in the work force. This mixed cultural will affect project performance and the duration. Once it comes to religious holidays of multi-national people, the Contractor's Project Manager cannot force the group of work since the government rules require respect of other religious traditions.
- 3) **Procedures and Formalities:** The laws for obtaining the work permit, visas for work force and the approval process needs to be considered because a bureaucratic process is required to handle these issues.
- 4) **Language Barrier:** In Dubai, the contract language is always Arabic and then translated into English. Most of the Clients, the Consultants and the Contractors prefer to speak and write in their own language whilst do not like to employ qualified interpreters. This generates some negative impacts to the communication, progress and quality of work. Using the Arabic language in the contract documents is an important aspect in Dubai and most of the construction organisations have not resolved the problems caused by this.
- 5) **Communication with the Client:** One of the cultural in the Dubai construction industry is that the Client is always right because he is the one who pays for the project. Particular attention needs to be paid when dealing with a Client in Dubai having much funding to invest (e.g. never say 'no' to

him; and his orders must always be obeyed). This causes confusion to the Engineers specially during the Client's site visit because change orders might be issued by the Client during the site visit which affect project progress. The contractor's engineers might not be able to fully understand on how to communicate or to deal with the Client due to the cultural factors (e.g. the Client's idea is always right) which is not easy to change, especially if the Contractor's Project Manager is not local.

- 6) **Wrong Time Estimate:** More than 95% of the work forces employed in construction projects in this region are Indian and they are not acclimatised to the Gulf weather especially in summer. This will impact directly on the cost and progress of projects. As a host country, it is necessary to inform all construction firms about the impacts of the weather. It has to be considered as a part of environment study and make sure that programme of work is checked carefully by experienced Consultants to include hot season adjustment while programming to avoid over optimistic progress estimates.
- 7) **The Importance of Time in Local Culture:** Most of the Clients in Dubai do not always see the necessity for prompt action with respect to their contractual obligations. Some words such as "Insha'allah" which mean in English "When God wants" are very familiar words and most of managers and site engineers use it as a promise which is a part of Islamic tradition culture. Foreign engineers do not understand the deep meaning of that word and may consider it as a part of uncertainty that causes disputes while executing the project.
- 8) **Local Partners:** Most of foreign design and construction companies have partnership with local firms. According to the government regulations, the local must have at least 51% of the joint venture company's share which authorise them to make immediate and important decisions, if there is a conflict between partners due to the educational differences or language barriers. It is not easy to change a local partner's decision if they confirm their decision. This is a part of traditional culture, which can adversely affect the work progress in construction projects.



### **3.5 SUMMARY**

Many cultural factors have to be considered by the Contractor's Project Managers in Dubai. It is a big challenge, but the main challenge is to cooperate and understand the rules of the local environment so that all the project participants, especially the Contractor's Project Managers, can understand how to effectively deal with the workforce. Understanding the reasons behind each factor and from where it originates, together with understanding the local language, will assist the Contractor's Project Managers to fulfil their contractual obligations.

It is very important for those who are involved in the project, whether they are the Client, the Consultant or the Contractor, to clearly understand the history, topography, religion, language and tradition of each party.

The culture in the construction industry is a shared understanding about what is expected to be done by all the parties. The cultural objectives must be very clear to avoid any disputes between the parties involved.

The understanding of culture i.e. the ideology, belief system, norms or behaviours and social order which compose society and traditions, is important to all the project participants.

The Contractor's Project Manager must clearly be prepared for understanding the following points to avoid stress and tension and to control the cultural aspects which can confuse him during design and construction of the project:

- Learn the basics of the local language
- Socialise with the host and other nationals on the project
- Be creative and experimental
- Be culturally sensitive
- Understand the complexities of the work force
- Be more realistic in expectations

- Be curious about culture
- Be friendly and avoid nervousness

*--- End of Chapter ---*

## **CHAPTER 4**

# **CONSTRUCTION OPERATIONS AND THE OBLIGATIONS OF CONTRACTORS, CLIENTS AND CONSULTANTS IN DUBAI**

## **4.1 INTRODUCTION**

Dubai has a very dynamic construction industry in both infrastructure and building projects, but there are conflicts between procurement process, project management and design management, which create uncontrolled circumstances that cause project delays. Avoiding delays in construction project requires a full understanding for the contractual aspects from the three involved parties in the project (i.e. the Client, the Consultant and the Contractor). Delays impact on the time and the cost of the project, conclusions of studies have agreed that the causes of the delay are not always caused by the Contractor but Owner interference, inadequate Consultant performance and other factors relating to contractual procurement, Contractor's obligations, management of the design, etc. are also causing project delays.

**Samuel C. et al. (1994)** confirmed that *"A very large range of parties involved in construction projects. Construction contracts determine the basis for the relationships between these parties, a contract is a promise or agreement that the law will enforce, a construction contract involves a promise by one party to provide services to build for another party who promises to pay for the work"*.

Section 4.1 describes the contracting environment which projects in Dubai are subject to. In Sections 4.3, 4.4 and 4.5, a major subject of the Contractor's obligations, Client's obligations and Consultant's obligations will be discussed in full detail in terms of their contractual responsibilities and how they relate to the contract procurement. This will focus on how the Contractor could be proactive in avoiding delays. Since he is the party implementing the project construction, the Contractor will be in a valuable position in regard to being responsible for delays whether caused by him or not.

This chapter first discusses the contracting and procurement approach adopted in Dubai; then reviews the obligations of the Client, the Consultant and the Contractor working in this environment.

## **4.2 CONTRACTING IN DUBAI**

### **4.2.1 The Importance of National Contracting to Governmental Projects in Dubai**

The enormous urban expansion in the Gulf and in the Emirates in Particular goes through an exceptional upswing so as to keep up with the growing need of the people for a suitable accommodation, and with the economic development that the region witnesses. This growth and demand has not yet reached the levelling off phase. This is shown by the continuity of constructional growth and the need for building and constructing in order to meet the overgrowing need for public services such as; roads, houses, schools, hospitals, parks, water and electricity, etc.

Everyone, who lives in the region or visits, cannot fail to notice the new projects implemented to provide the infrastructure that is a necessity for any city undergoing rapid development. In order to carry out what is being planned, there must be private construction companies capable and competent enough to carry out the large Government's schemes to ensure the continuity of construction in the region. It is thus evident that the Government would have as one of its principle goals the creation of a strong private sector specializing in the field of building and construction. Several national construction companies play a prominent role in the fulfilment of the Government's projects concerning the constructional growth. Details of how the government promotes a strong construction sector are given below.

### **4.2.2 GENERAL CONTRACTING & INDIGINOUS COMPANIES**

#### **4.2.2.1 The Building Transaction and the Indigenous (National) Firms**

The definition of the national building transaction can be extracted from the official Decree No.4 issued in 1980 concerning the classification of building Contractors. It defines the national building Contractor as being:

The national agent, the companies, the establishments and the other institutions or agents among the common agents to which the contribution of the national capital and if it was necessary to define the national constructional company, it is also essential to define the activities of these company and to provide a statute by which we classify these institutions so as to make it easy to the Government to ensure their presence in each project depending on their outlay and size in a way that the projects would be implemented without halts.

Undoubtedly, implementing these projects is directly affected by the Contractor's financial and technical abilities to accomplish the projects in their different phases, because any lagging may disturb the Government's advancement programmes, the development policies and the constructional growth which are related to different sectors such as; services, transport and housing.

Therefore, in 1980 the Government has laid down a law according to which the Construction Companies are divided into different categories and domains depending on their financial and technical abilities. The companies were divided into: special category, first category, second category, third category, fourth category and fifth category, in a way that the technical body of the company and its previous skills as well as the capital play a prominent role in defining the class or category of each company and the projects it can handle.

This law graded construction companies in terms of size, their abilities and their scope of competence. This helped the Government to study clearly the private sector and define the specific companies that would be considered for tendering for its various projects. Thus, it would guarantee its own rights and protect the national companies regardless of the class they may belong to by providing the convenient transaction to each company depending on its category and specialty.

In previous years, it can be seen that the evolution in the number of national construction companies rise in accordance with its domain and category. In fact, the fertile milieu of work in the current situation of the region has encouraged several

capitalists to enter the construction field; as a result of this, there is a wide range of companies with the ability to put into practice the Government's building plans.

#### **4.2.2.2 The Ability to Implement the Government Projects**

The Government's projects are mostly large scale and of special character, that is the reason, "special" and reputable companies are appointed to carry out plans which are worth hundreds of million or even billions of Dirhams. This expresses the need for companies with a major capital base and a large trained labour force. These projects are also of special importance to the Government's security. So, the need for national companies to be involved in these projects is great.

#### **4.2.2.3 The Quality on the Level of Implementation**

One of the most important factors for the success of any project, either for the Government or for the private sector, is the quality of work final functionality. So, it requires construction companies that can provide these factors when carrying out any project. All the national companies realize how closely related these factors are to the company's reputation and this may also be a prime factor upon which the Government chooses a company and not another. Moreover, any failure in implementation may cause significant losses being inflicted upon the selected company.

#### **4.2.2.4 The Speed in Implementation**

The question of time is extremely important to the Government's programmes and the plans it puts forward concerning building and construction and any delay in the Government's projects may have a negative results. This delay can hinder the Government's policies regarding the urban expansion and the people's need for houses. It may effect the economic growth which, by itself, is based on the continual progress that is carried out within definite periods of time and according to the long run plans of the Government.

#### **4.2.2.5 The Government's Contribution in Reducing the Project Cost**

One of the benefits of having an adequate number of national companies is honest competition. These companies would compete in offering the best prices in order to win the tender and by encouraging lower bids through increased competition, the Government would make some savings. Without a sufficient number of qualified national companies, the ones available would monopolize the Government's projects and consequently tend to offer high prices. It is clear therefore that the Government needs solid, secure and competent firms to ensure the implementation of its plans. For this reason, the Government would support these companies and try to protect them to ensure their existence and their survival since the construction sector needs all the companies regardless of their size or especially for each one has a definite role to play.

#### **4.2.2.6 The Difficulties facing the Construction Companies**

It is very important to any Government to reduce the problems that the construction companies may face and to free this sector from difficulties or obstacles that can hamper the existence of national companies, which are able to implement the Government's projects with high proficiency and within the fixed terms. In fact, the major pitfalls of this sector, either in Dubai or in the other Emirates, may have a negative effect on the implementation of projects. **Jawad F. (1998)** itemised some of these difficulties they face as follows:

- A. The lack of skilled labour and the absence of concern with the professional promotion of high professional calibre in the work force. In this sense, many international companies invest some of their capital in training their labour, this has proven to be very effective and would help in ameliorating the proficiency and the speed of work and this may enhance the company's reputation in the field of construction.
- B. The abundance of the small firms with a capital of which does not exceed a million Dirhams. These companies may have a bad influence on the competition in this field moreover these companies are unable to carry out the



large scale or even the middle-sized project of the Government. Furthermore, they cannot achieve the limited time programme due to lack of labour and equipment. It is remarkable that such companies are easily affected by the market's ups and downs and by any periodic economic stagnation which causes the scarcity of projects. In such situation these companies quickly go bankrupt and cease to exist.

- C. The greed over commitment of construction companies' resources is another problem. Most of these companies want to get the greatest number of projects possible. The multitude of projects may be beyond the company's capacity and may cause delay in delivery. Any surpassing in the time limit will automatically lead to a fine inflicted on the company. Thus, the policy would cause a double loss, one for the company and the other for the beneficiary.
- D. The absence of specialized companies, which are proficient in specific domains in the field of construction i.e. companies specialized in electricity or mechanics. The specialization is already available in developed countries such as the United States, where you can find several specialized companies internationally renowned in a specific domain.

**Jawdat F. (1998)** said *"Finally, may be it is time that the national construction companies free themselves from these problems or pitfalls and try to reach an international level and compete with the international companies."*

*By using up-to-date scientific methods in construction and by providing state of the art equipment, the national companies can keep ameliorating. Thus they can keep up with the international competition and at the same time be more effective in implementing the Government projects in the region".*

### **4.2.3 PROCUREMENT**

#### **4.2.3.1 Definition**

According to **Pilcher R. (1992)**, *"Procurement system is the contractual and organization arrangements for designing & constructing a building or civil*

*engineering project. There is a relationship between the Client, the Contractor & the Designer."*

Once the design is approved, the procurement method can be chosen in relation to project type and a suitable Contractor duly selected.

It is important to make the distinction between procurement systems and contracts. The procurement system refers to the overall method of production from inception to completion and defines in general terms the contributions of each project participant in terms of who does what and when. The contract is used within the procurement system and is merely a legal document that binds two or more parties together in some kind of formal agreement. It defines the terms of the business deals and the procedures that should be followed in the event of certain things happening. There are a range of contracts that are used within each procurement system. Typically those between the construction professionals and the Client in the pre-contract stages are much less detailed than those used between the Client and Contractors in the post contract phase. The reason for this is historical and lies in the lack of trust which has developed between the Client and the Contractors.

**Anderson S. (1996)** confirmed that *"The more detailed Client /Contractor contracts are a reflection of this lack of trust and an attempt to control the Contractor. There are new moves to increase the detail of the Consultants contracts but this is being fiercely resisted by the professionals. Most of the contractual developments over recent years have been focused upon the contracts used between the Client and Contractor and there are now some 50 alternatives contracts available (including Subcontract forms) for use in different circumstances"*.

#### **4.2.3.2 Contractual Relationship**

The party that is the customer of the construction industry is known as the Client or the Owner and he could be an individual, a group of people, a partnership, a limited company or a local or central government authority.

In Dubai some Clients are not familiar with some of the important construction processes and need to obtain advice from their Consultants on the following points:

- A. Feasibility studies
- B. The design of the work that are proposed
- C. Preparation of the contract documents
- D. Tendering procedures and evaluation
- E. Construction programming and scheduling
- F. Method of supervision of construction
- G. Method of payments
- H. Dealing with variations and claims

To avoid delays, claims, and the consequent disputes among the Client, the Contractor and the Consultant, Dubai Municipality distributes a condition and update clauses every 6 months to remind and advise each and every Client about their role in the project.

The organized contractual relationship can be classified within three groups as follows: traditional, design and build, and management.

#### **4.2.3.3 Traditional Procurement in Dubai**

Most of organizations in Dubai are using the traditional procurement method in their projects.

##### **4.2.3.3.1 Definition of Traditional Procurement**

It is one in which the Client has a direct contact with the Consultants to carry out the design of the works and also probably the supervision of the construction, with a quantity surveyor as one of the Consultants. The quantity surveyor will give advice on a range of matters relating to the cost of the work as well as preparing some of the contract documents and measuring the work completed for valuation and variation purposes together with the preparation of a final account. The Consultants are

normally independent professional practice, with no ties to construction or property development commercial undertakings. The Client also has direct contact with the Contractor. The latter is likely to be in contract with suppliers of materials of all kind and with the Sub-Contractor for carrying out specialist works and equipment installations.

Some of the suppliers and/or Sub-Contractors may be nominated by the Client or on his behalf by one of the Consultants. Such the Sub-Contractors will normally be selected after submission of their tender to the Client, and the Contractor is then instructed to enter into a contract with the nominated Sub-Contractor in terms that are specified by the Client or the Consultant. Other subcontracts, those arranged by the Contractor, are known as non-nominated or domestic Sub-Contracts and are subject to the approval of the Engineering or Architectural Consultant.

The Owners consider that this traditional Procurement System is good and it gives them a good satisfaction in cost & quality but at the expense of time due to a lot of reasons on time of constructions such as:

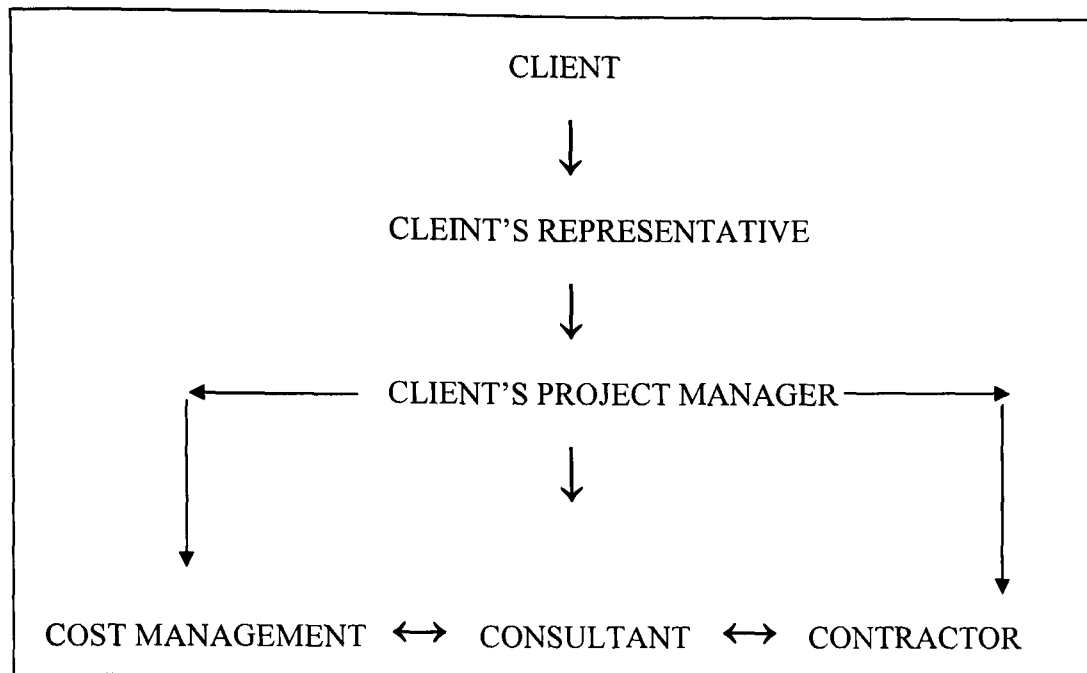
- a) Risk: It is distributed almost equally between all parties and all will be involved in case of any problems.
- b) Speed: Most of the Client's insist in having all information complete in the tender stage as well as the Consultant & the Contractor.
- c) Quality: The Client's requires certain standards to be described and the Contractors are responsible to achieve the quality of work to keep the Client & Consultant satisfaction and to keep their progress and getting more work in future.
- d) Flexibility: Most Client's are modifying or the design during construction without substantial change cost at same time Contractor's substitute or amend cost as in additional rates to cover such variations.
- e) Responsibility: each of three parties knows the limit of his rights and responsibility and no change on design given by proposal through Contractor or Subcontractor.
- f) Certainty: only certainty in cost & time before commitment to build and clear accountability and cost monitoring at all stages.

The Dubai Government has defined in last five years the system of procurement in the construction process as follows:

- 1) Concept understanding
- 2) Preparation of the brief include planning permission
- 3) Design (double checking procedures)
- 4) Tendering System
- 5) Construction process from design to commissioning

The description of all above activities should be implemented and understood carefully by all parties to avoid any disputes between them or any claim for the project.

The most common Procurement method used in Dubai is the traditional procurement method. It involves the separation of Construction from design. A main contractor is employed to build what the designers or consultants have specified. The basic defining characteristic of Traditional Procurement is that the Contractor agrees to produce what has been specified in the documents. Consultants acting on behalf of the Client produce the documents and Contractor produces the building. In theory, the Contractor should be invited to price a complete set of documents that describe the proposed building fully. Such documentation demands that the architect (or lead designer) co-ordinates design details from a wide variety of specialists. The result is that the Contractor has no responsibility for design. The contractor's offer of price is based on costs and rates entered in the Bill of Quantities, a document that itemizes and quantifies, as far as possible, every aspect of the work. The bill forms not only the pricing document but also, because of its comprehensiveness, an important mechanism for controlling cost and payment as the project progresses.



***Fig.4.1 The Contractual relationships in Traditional Procurement***

Therefore, it has a central role in the process and the quantity surveyor, as the author of the bill, is an important contributor. Traditional Procurement, then, revolves around the relationships between client, consultant, quantity surveyors and contractor. The contractual relationships are summarized in the Figure 4.1 above.

Structural and services engineers provide specialized design advice which is co-ordinate by architect. In civil engineering projects, the Consultant will generally be a civil engineer and will co-ordinate the design advice from other specialist engineers. These specialist engineers will often take on the supervisory duties as well as design. The purpose would be to visit the site and inspect the work to ensure that the work is produced in accordance to the design. There will be problems when work does not concur with design. Such problems only can be resolved by examining the means by which the Contractor was instructed what to build. The importance of the documents used for this purpose is self-evident. It is for this reason that the standard-form contracts tend to oblige the Contractor to produce precisely what is in the documents.

One of the key documents in traditional contracts is the Bill of Quantities and it cannot be finalized until the design is completed. It is usually impracticable to prepare a complete design before contracts are formed because of the limited time available, which is usually based on a timetable set by the Client. Also, sometimes choices need

to be left as late as possible in the process. If design is only partially completed then general contracting operations begin to suffer because it is based on the assumption that the Contractor prices, and builds, what has been documented. When the documentation is incomplete, there is high demand for communication and coordinated information supply. These demands render the process very difficult to manage. Similarly, when complex technologies are required, the need for specialist sub-contractors can place too many demands on the co-ordination and information systems. Clearly, there are problems if traditional method is used where it is inappropriate. Therefore, guidelines are needed as to where it is best suited, and what adjustments to the contract are necessary to cater for a specific project conditions.

Some Contractors in Dubai do not prefer the traditional system of procurement, (AL. Rais, 1990. Specific reasons for this are also given in Table 6-5 in Chapter 6).

- 1) Poor relationship between the Designers & Contractors either in culture, environment, profit, factor of safety specialty.
- 2) Most Clients are not aware of Alternative Procurement system.
- 3) Lacking of design information.
- 4) Less experience of Architect's
- 5) Variation and changes by the Client.
- 6) Lack of Contractor involvement in design
- 7) Less experience of quantity surveyor in design, leading to not control of the cost.
- 8) Less planning of pre-contract stage.

Since traditional procurement is widely used under circumstances which are not always clear to any Client or Consultant, delay to project work activity regularly occurs. Most of the Contractors Project Managers in contracting companies admit that the approach of procurement, which is adopted during tender stage, does not suit the type of the project they are working in, (one of the causes of project delays). The Consultant would therefore be advised to consider the appropriate procurement type during the design stage so as to avoid delays in the project construction stage.

The following factors will be familiar to the Contractor's Project Manager, The Consultant and The Client, working under traditional contract forms, as areas for improvement that can reduce delay (**Anderson W., 1997**).

- 1) Establishment of client's objectives at the start of the project is often problematic and more time and energy should be given to this crucial phase of the project.
- 2) Increase the role of the customer in the process. The customer should play a leading role at key stage in the project.
- 3) The whole process including the pre-contact stages should be more effectively planned.
- 4) Clients should be made aware of the alternative procurement and contractual systems available.
- 5) Variations and changes is a major and frequent problem and it always has to be controlled and monitored.

Some terms and conditions in Traditional Procurement type could be a major reason to cover any delay such as a design change, variations, provisional sum items, prime cost items, the nominated Sub-Contractors and changes from the Client during constructions.

#### **4.2.3.3.2 Selecting the Procurement Method**

It is important to understand what form of procurement is the most appropriate one for a given project. This will assist in the effective management of the project. Many projects still suffer from inadequate or inappropriate procurement decisions. The most important criteria for choosing the suitable procurement method are:

##### **1) Client Involvement**

Some clients would wish to be centrally involved on day to day basis, whereas others might prefer simply to let the design & construction team gets on with it and pay for it when it is satisfactorily completed. This decision will depend, at least in part, on the Client previous experience of projects but also on the responsiveness of the Client's organization.



## **2) Separation of Design and Management**

The principle that applies is the extent to which design philosophy should form the basic unifying discipline of the project, or whether more quantifiable aspects should prevail. In the former case, it would be inadvisable to divide management from the traditional purview of the design leader. Such a distinction may emasculate the architectural processes and reduce it to mere ornamentation. But this is not always the case: not all projects are architectural. There is a marked difference between the procurement methods in this respect.

## **3) Reserving the Client's Right to Alter the Specification**

There are three reasons for altering the specification. Firstly, the Client may wish to change what is being built; secondly, the design team may need to revise or refine the design because of previously incomplete information; and finally, changes may be needed as a response to external factors. Although it is quite clear that a construction contract imposes obligations on the Contractor to execute the work and that right cannot lightly be taken away. If a Client wishes to make changes to the specification as the work proceeds or wishes to allow the design to be refined for whatever reason, then clauses will be needed to ensure this. However, the procurement decision affects the extent to which the contract structure (rather than clause content) facilitates changes.

## **4) Clarify of Client's Contractual Remedies**

An important part of the contract structure is the degree to which the Client can pursue remedies in the event of dissatisfaction with the process. Some contract structures are simple, enabling clear allocation of blame for default, whereas others are intrinsically more complex, regardless of the text of actual clauses. One of the legal aims behind a contract is to enable people to sue each other in the event of non performance.

## **5) Complexity of the Project**

Complexity cannot be considered in isolation because it is inextricably bound up with speed and with the experience of those involved with the project. It is also a very difficult variable to measure. Although technological complexity is a significant variable, it can be dealt with by utilizing highly skilled people. What is of more concern in the procurement decision is organizational complexity. Roughly speaking, this can be translated into the number of different organizational units needed for the project. This means that a project with a large number of diverse skills is more organizationally complex than a project with fewer skills, even though the few may be more technologically sophisticated. Each of the procurement methods can be used for wide range of complexities.

## **6) Steps from Inception to Completion**

One of the most distinctive features of construction projects when compared with other projects is the overall duration of the process. Since a single construction project typically constitutes a large proportion of a Client's annual expenditure and a large proportion of a Contractor's annual turnover, each project is individually important. Many developments and refinements to procurement methods have been connected with a desire to reduce the duration of projects. The process of construction is essentially linear. Briefing, designing, specifying and constructing must follow one from the other. If these steps can be overlapped, then the overall time can be reduced significantly, provided that there is no need for re-work due to changes and wrong assumptions, in which case too much overlapping can slow the process and cancel any gains due to overlapping.

## **7) Certainty of Price**

Price certainty is not the same as economy. It is doubtful that there is any correlation between economy and procurement method. The reliability of initial budgets is highly significant for most Clients. However, this must be weighted against the

financial benefits of accepting some of the risks and with them, less certainty of price.

#### **4.2.3.3.3. Choice of the Appropriate Form of Contract**

Project Managers in Contracting often complain about the form of contract of their project because many contractual problems appear during construction due to the deficiencies in preparing or selecting the contract form. The Consultants who are in the position to rectify these deficiencies need to evaluate the project detail so as to select the appropriate contract form. **Anderson W. (1997)** confirmed that “*the nature of the Client and his experience in contracts, the nature of the project and method of selecting the Contractor are some of the major points for forming the contract*”.

When the Consultant approves the design from the Client, the procurement method must be prepared in full details. Unfortunately the Consultant does not always consider the procurement type during the design stage. The reasons for this could be:

- The Consultant does not have enough experience;
- The Consultant has a heavy work load;
- The Client is not interested; and
- The Consultant receives less fee for the job that he is working on.

This has the potential to create future delays when the project is under execution.

If the procurement method is not immediately clear, and the project does not clearly demand some specific approach, then a traditional contracting is probably the best for this type of Client, Consultant and Contractors. The choice of which form a contract to use depends on a further set of criteria (**Anderson W., 1997**):

- The amount of design that needs to be done before the Contractor is selected
- The level of nomination required
- The duration of the contract
- The time constraints
- The susceptibility of the Contractor's costs to market fluctuations
- The overall size and complexity of the project

- The extent to which the Client is liable to change the brief during design and construction stages
- The method by which the Contractor should be selected
- The ability of the Client and / or architect to manage and coordinate
- The novelty of the project
- The skill and experience of the particular Consultants being engaged for the work

The above criteria are the responsibility of the Consultant and the Client. They must consider these criteria in terms of design management, as discussed in the previous section of this chapter. The Contractor must also consider these criteria if he is involved in the design. Unfortunately the Contractor may well suffer from deficiencies in the contract after signing the contract. Problems, delays, claims, changes and disputes will occur at this stage to carry out the works in the contract documents. The contracts also state the quality and the quantity of the work. Bill of Quantities, if used, will usually be required by the contract to be prepared according to the specified standard method of measurement. In building contracts, certain items specified in the bills, have to be done to the reasonable satisfaction of the architect. Some contracts go as far as saying that the Contractor must comply with any instruction of the Consultant, on any matter concerning the works whether mentioned in the contract or not! Clearly, there is a wide variety of practices in the way that standard contracts deal with the Contractor's obligations.

Therefore when choosing the procurement method, the criteria for selection should be studied very carefully and the allocation of the risk should be made explicit, rather than implicit. Risk evaluation is directly linked to design and execution and it must be studied very carefully from three involved parties in the project to avoid the delay in the project.

### **4.3 CONTRACTOR'S OBLIGATIONS**

According to FIDIC Clause 8.1, 1987 fourth edition which is part of the general obligations of the Contractors, the Contractor shall execute and complete the works and remedy and defects therein in accordance with the provision of the contract.

The Contractor's obligations begin with the construction of the works in accordance with contract documents within the required time. The subjects in this section will deal with fundamental obligations and associated obligations as to workmanship (contractual responsibilities), quality of materials (specifications and standards) coordination and site management (in general), as they relate to specific contract requirements in FIDIC (1987).

**Maurice W. (1999)** stated that *"The nature of what the Contractor's obligations is, depending upon the way in which the type of contract is used. If the contract is for a complete building, then it is implied that the Contractor will provide everything which is indispensably necessary to achieve the result, regardless of what is contained in the specifications"*.

#### **4.3.1 Standard of Works**

The Contractor's basic obligation so far as the standard of work is concerned is to comply with the terms of the contract (including both expressed and implied terms). In addition, there are often provisions in the Bill of work to be to the satisfaction of the Consultant. This may allow the Consultant to reject such work (limited by his power under the contract). Approval of workmanship or materials is a matter of the opinion of the Consultants. Where a Contract requires work to be to the specification of the Consultant, an important issue is whether this becomes the only contractual standards or whether the Contractor must satisfy whatever objectives standards are contained in the contract document. Also what the Client is allowed to discuss that, notwithstanding its approval by the Consultant, certain work does not comply with a standard set out in the contract bills. The answer to this question, as is so often the case, is that every thing depends upon the wording of particular contract, although the

weight of authority has traditionally been in favour of making the Contractor satisfy both standards.

Form the above, if the conflict continues between the Consultant, the Client and the Contractor how is it possible to establish how much delay will occur and what the main causes for this delay are

**Clause 361 in FIDIC 1987** shows the importance of the standards of work. The following are key areas that can give use to delay or extra cost:

### **1) Workmanship**

The standard of workmanship must be defined in full details by the Contract Documents and Contract Bill, this will give the Consultant the full authority to ask for appropriate workmanship without giving the Contractor any chance to waste time or discuss about standards of work, will help both of them to avoid the delay.

### **2) The Engineering Profession**

All required goods and materials which will be used in the project must be supplied in a satisfactory quality means that they are to be as free from any defect or technical fault and they must be selected as per the procedures defined in the conditions of contract. Consultant and Contractor must be fully aware how to deal with the item of the materials and what are the material standards otherwise a big delay will occur and it may become one of the major reasons for the delay.

### **3) Material Suitability**

Consultant must make sure that the selected materials for the projects are completely suitable for the project purposes and must comply with standards and specifications not ignoring the Client wishes for the suitable materials and the reason behind choosing the Client these materials. This must be prepared in very early stage during submittals and approval from Consultant and Contractor to avoid delay because

approving and ordering the suitable materials is an important subject in project progress. However **Gloucestershire C. (1969)** stated that *“The contractor will not be liable for defective materials where forced by the employer to obtain those materials from a supplier who, to the employer’s knowledge, excludes or limit liability for defects”*.

#### **4.3.2 Statutory Obligations**

Statutory obligations are the obligations imposed by the Government regulations and legislation it is a clear fact and all parties must obey the law and any failure to comply with the statutory obligation will cause a delay for running the project noting that it is the duty to consultant to clear specifically who is in-charge for statutory obligation in contract document either Client or the Contractor while signing the contract.

##### **1) Contractor’s Duties**

It is the Contractor’s duty to comply with local authority regulations and requirements and also with regulations made by statutory undertakes such as electricity, water and telephones, to whose systems the works are to be connected. Normally the cost is paid by the Client. Any failure by the Contractor to do so will cause a major delay for running the project.

##### **2) Conflict between Contract Documents and Statutory Requirements**

If there is a conflict between the contract document and statutory requirements, the Contractor has no responsibility for the conflict except to informing the Consultant as soon as possible so as to avoid the delay. The Consultant must issue new instructions so as to bring the work consisted with the statutory requirements. In that case no delay will occur but the Contractor will get paid for the extra work needed. The Contractor has the right to claim for extension of time and cost implications of the extension, which is not preferable to most of the Client’s.

### **3) Emergency Work**

To avoid any delay to the project during design, the Consultant must inform the Contractor through Contract documents (design management) or during the work about any required emergency work which is necessary to comply with statutory requirements. The Contractor must undertake such limited work and supply such limited materials necessary to ensure compliance with statutory obligations. It is a very important point during design and implementation for the Client, Consultant and Contractor to ensure that all emergency works have been considered during implementation (design management phase and pre-construction phase).

### **4) Health and Safety**

Accordingly to **Sims and Lyndon Necropolis (1999)**, *"The Contractor obligation for health and safety is essential. During the design, the Consultant must prepare the health and safety plan to make sure that all Contractors and Subcontractors are subjected to test of taking reasonable steps to ensure that they have adequate competence and resources for fulfilling the health and safety obligations. All necessary information must be clearly furnished in complete to all parties in order to avoid any unexpected problems which may delay the project progress"*. The Contractor must follow the construction design management and implement all necessary requirements to avoid any problems.

**Clause 19.1 in FIDIC** informs the Contractor to adhere to principles of health and safety regulations.

#### **4.3.3 Coordination and Management**

To avoid any delay for the project the Contractor has to plan carefully after signing the contract by preparing a pre-construction plan, construction plan and handing over plan. Those plans will be discussed in full detail in the followed chapters. Implementing these plans will considerably reduce the pressure on the Contractor's



Project Manager and gives him basis to manage the project and reduce the risk of problems arising.

### **1) Control of Persons on Site**

It is the Main Contractor's responsibility to programme the overall project and coordinate the contributions made by different person and organizations, such as domestic sub-contractor's and nominated sub-contractors. This duty is to organize all the people who are working under his supervision, direct them, prepare their programme of works, monitor the quality of production and keep planning for the different type of sub-contractor works. However any failure in coordination between the persons in site will create a major problem, especially all the finishing stage. The Main Contractor is also required to ensure that there is access and storage to the sub-contractors to ensure their performance in duty.

### **2) Exclusion of Persons from the Work**

To avoid any delay for the project it is the Contractor's project manager duty to employ skilled people to properly undertake their duties with an appropriate level of care. If there is a failure of workmanship standard, the Consultant has the right to remove the person from the site, this is to the benefit of the Client to ensure the quality and to Contractor to ensure the productivity and cost effectiveness. The Main Contractor must apply very strict regulations to all persons and make sure that they comply with the work regulations (this must be stated clearly in the Contract documents). People must be allocated adequate authorities to be able to complete their tasks. **Anthony R. (1988)** stated that "*management control can focus on the activities of the responsibility centres*". So it is important to concentrate on the organizational structure where the management and responsibilities are clear to every one on the site which helps the Contractor's project manager to employ his authorities.

### **3) Testing and Approvals**

The Consultant during the design stage must identify all the necessary tests, which are required by the Contractor to make sure that the quality standards have been achieved. The Contractor must carefully check the terms and conditions, which obligates him to open up work for inspection or testing. Method of testing, checking and approvals must be clear to the Consultant (during design) and the Contractor (during execution).

#### **4.3.4 Materials Transfer**

The regulation of transferring the ownership of the materials from the Contractor to the Client must be known and clear to both parties because it is a part of the rules, which defined by Government.

##### **1) General Position**

Any goods or materials incorporated into a building cease to belong to the Contractor and become property of the Client. Until the materials are built in to the works, even though they have been delivered to site, they remain the property of the Contractor. Even the fact that the Client has paid the Contractor for the materials will not make difference, unless (as is usually the case) the contract makes express provision for this.

##### **2) Contract Provisions**

Terms and conditions in contract do not alter the principle that the ownership of the materials is transferred when they are incorporated into the building but some conditions provides a method by which ownership may pass to the employer at an earlier stage. The value of unfixed materials intended for the works whether they are on or off site, may be included in an interim certificate if this is done then the ownership of this material will pass to the Client as soon as the amount is duly paid.

### **3) Retention of Title**

The Contractor may deal satisfactory with questions of ownership as between the employer and the Contractor; however problems may arise in cases where the Contractor brings on to the site materials which are still in the ownership of a supplier. In particular many suppliers operate under conditions of sale, which provide that they shall retain the ownership of materials till fully payment is made.

There is a possibility of conflict between the terms of the main contract and those of the contract of supply, which may delay the project progress.

#### **4.3.5 Follow-up of the Consultant's Instructions**

The Contractor must follow and obey the Consultant's instructions which may be in verbal or written form. Those instructions are issued to the Contractor may be based on Client changes or due to the failure in Contractor performance. These instructions should be recorded officially for any changes, variations, claims, delays or any other reason could be beneficial to any party involved in the project the Contractor and his Sub-Contractor or Consultant.

#### **4.3.6 Updating the Master Programme of Works**

Some of the major obligations of Contractor is to update his master programme (monthly approved contract programme, **Clause-14** in **FIDIC**) to reflect the contract progress. Noting that the planning Engineer of the Contractor should be always aware of and follow-up the material procurement, submittal and approval of material schedule, work progress on site, cash flow and payment with the Contractors Project Manager. This will help the Contractor's Project Manager to follow up the work progress and give him advance warning of any delay, and which may investigate corrective action.

#### **4.3.7 Preventing and Avoiding Delays (Contractor's Project Manager Duties)**

It is the responsibility of the Contractor's Project Manager to manage and to direct the project from the date of the contract till handing over. During pre construction stage he should check and read in details the contract documents including the following listed work activities:-

- 1) **Planning:** The Contractor's Project Manager must prepare the tentative programme and the detailed Contract Programme with the assistant of Planning Engineer. Both must set, plan and agree the dates from the commencement date till handing over. Both must also consider that the Master Programme must include the mile stone dates for the materials approval, nominated suppliers, nominated sub-contractors commencement date, work activities in details, commissioning and testing, substantial handing over date and final handing over date.

**Kim Y. et al. (2005)** confirmed that *"To ensure that the agreed construction duration is achieved, most construction contracts require the Contractor to submit a planned schedule, which is then maintained and up dated through the life of the project. The Contractor's actual progress is normally measured against this as planned schedule"*.

According to **Walker D. and Shen Y. (2002)**, they have stated that *"Understanding the Construction Time Performance (CTP) is another major important part to achieve the effective planning and control to avoid any delay since planning is an evolving process."* Analyzing the Construction methods and monitoring the plans are factors affecting the (CTP) and its importance to the Contractor's Project Manager and the Planning Engineer to keep following for maintaining the project control and planning in general.

Meantime the work activities should be listed in sequence with starting date and finish date showing all the possibilities for critical path.

- 2) **Organization:** The Contractor's Project Manager during the pre-construction stage must develop the organizational structure of the project staff defining the job description in detail for each person on site. **Hammer and Champy (1999)** stated that *"Tasks and jobs of the team work should be kept as simple as possible and be incorporated with in simple processes. This will ensure the optimum working flow relating to each process. In order to meet the contemporary demands of Quality, services, flexibility and low cost, processes must be kept simple"*. Meantime he must check their qualifications and site experience to ensure that their capability to work is with the quality, regulations, terms and conditions of the contract. Staffing and staff administration is a part of his duties. The Contractor's Project Manager must be is aware of problems of his site staff. This will help him progress the work and prevent any delay by additional training of his staff, creating a sustaining moral and keeping a good relation between staff. Also, communication and feed back on progress through daily meeting which is both necessary to him and the site staff.
- 3) **Contract Administration:** To avoid contractual problems during work execution which may cause future delays, the Contractor's Project Manager must check details during the pre-construction stage in the Contract documents. He must read the terms and conditions to make sure that all of them are compatible with the project strategy. Meantime there must be a check of the described works in the Bill of Quantities and compare it to the drawings. Any discrepancies, which may affect the project financially, technically or legally must be identified and resolved.
- 4) **Selecting Sub-Contractors:** Since the Contractor's Project Manager is already involved in the execution of the project he must be involved of appointing the domestic subcontractors and explain to them the technical requirements, specifications, completion period required, quantity or quality for the type of the job and finalizing the quoted price for the work because he is the only one who

knows in detail the total cost of the item including the overhead and profit percentage. **Seppala C. (1995)** stated that *"The subcontract agreement should contain certain clauses, which are designed to protect the interest of the project and the Client. The form of subcontract agreement has recently prompted FIDIC to draft a negotiated subcontract for use of the FIDIC contract and make it reasonable to the Sub-Contractor"*.

Meantime the Contractor's Project Manager should coordinate with all Sub-Contractors to prepare for the shop drawings and AS-built drawings from all concerned parties to help him avoid any delay.

- 5) **Technical Management:** As mentioned the Contractor's Project Manager should ask for shop drawings where appropriate and coordinate them together with a method statement for each work activity. The organization of the submission and approval for samples by Consultant must also be obtained.

A direct contact between the Technical Department, Tender Department and the Contractor's Project Manager is essential in order to inform them about the status of the project financially and technically. This can also help to avoid delays.

- 6) **Communication and Performance:** A proper communication between the Contractor's Project Manager and his site staff is essential, as explained in Item-B. Another key area of communication is between him and the Consultant or the Client's representatives either by daily, weekly or monthly regular meetings. These are necessary to discuss the latest stage of the project, technical matters relates to the progress of works or any other problems which may cause a work delay. Verbal communication should be in an atmosphere of respect and official communication must be confirmed, recorded and documented in a consistent and agreed form because this will help all the concerned parties to perform the work in an efficient manner.

#### **4.4 CONSULTANT'S OBLIGATIONS**

The Main Contractor is fully responsible for implementing the project as per the contract documents (i.e. drawings, specifications and standards, bill of quantity etc.) The design must be prepared by the Consultant and full details supplied to the Contractor as per the Client's requirements.

**Al Khalil M. (1999)** stated that *"The Client may become frustrated with the low qualification of some of the design firms due to the limited interaction between the Client and the Consultant during the design phase of the project"*. This may cause a major delay to the project completion date. The Consultant should be fully aware of his duties to avoid any problem which may affect the design process.

Design, which includes both the board concept of the building but also matters of considerable details, is the responsibility of Consultant design team. This normally consists of an architect; backed up where necessary by other specialist consultant such as structural Engineer, Service Engineer, etc.

**Clause 2.1 in FIDIC** shows and indicates some of the duties of the Consultant office and the Resident Engineer. The duty of the Consultant could be divided into two stages, the design and execution stage.

##### **4.4.1 Design Stage**

Due to the complexity of the required information during the design, it is not easy to achieve the design decision without a proper comprehensive documents prepared by specialist's through the stage of process and procedures. These stages interact with each other in a way to guarantee that the design match the Client's requirements as well as being constructible. Some of these stages are briefing, feasibility, outline proposal, scheme design, detailed design, contract preparation, construction and commissioning. The point about these various stages is that each involves different designers or participants. Moreover the task changes at each stage. Thus, as the mass of Project documentation grows, different specialists are employed, decisions are

made and recorded, the relevant importance of different alternatives and various interest groups take part in decisions that effect the nature and scope of the project.

### **1) Start-up Meeting**

**Hughes G. C. (1994)** confirmed that *“It is essential to identify at each key stage in the process, the key designers and the personnel in their teams. A startup meeting is a meeting initiated by the Contractor’s Project Manager (Client representative) and differs in purpose from all other forms of project meeting. The principles are:*

- *To introduce to one another those involved at the particular stage of the project.*
- *Attendance of all the relevant people is essential and the Contractor’s Project Manager must decide who attends the start-up meeting.*
- *That the meeting lasts one day with no interruptions.*
- *That all parties prepare a short presentation of what they think as the objectives of the project and their contribution to it.”*

### **2) Scheduling Start-up Meeting**

The key stages during the design process when start-up meetings should be held are at the start of briefing, the start of scheme design, and the start of engineering design. At each of the above points new people from new organization must be introduced. They must have some knowledge of the project and may have different priorities. *“The designers should also be involved in the start up meetings at the beginning of each construction stage as such structure, sub-structure, envelope, service and internal finishes” (Hughes G. , 1994).*

### **3) Briefing Stage**

*“The object of the start up meeting at the Briefing stage is to initiate the preparation of the statement of need. This is the key document required by the Contractor’s Project Manager to enable a proper briefing of the design team. The purpose of the meeting is to bring together the key contributors so that a mutual, in depth*



*understanding of the Client objectives can be achieved” (Hughes G., 1994).* This will bring together the Clients, Client representatives and briefing team leader. During the meeting the final discussion must be approved and the design team will proceed.

#### **4) Scheme Design Stage**

Once the brief is clarified and the project approved for the next stage, a meeting of the developed and enlarged team is necessary. The object is to decide the scope of the individual studies necessary to develop the project to the completion of the scheme design. It is the stage of intense creative activity and evaluation of alternative strategies for the building. This will bring together the Client representative, the briefing team leader, the design Consultant, Sub-Contractors and the Contractors Project Manager.

#### **5) Engineering Design Stage**

According to **Hughes G. (1986)**, *“When the scheme designs are approved the design team must meet to confirm and achieve the co-ordinate approach between the different styles and culture of the design consultant, Sub-Contractors and the specialized team work. At this stage the construction information will be developed and all each of consultant must co-ordinate with the other for any enquiry”.*

#### **6) Structuring Start-up Meeting**

As all the team managers understand the integrated nature of their contribution so that the traditional negative barriers will be broken down. Regular meetings are very important which will let the participants be aware of the purpose of the meeting.

#### **7) Contractor’s Project Manager at the Start-up Meeting**

The Contractor’s Project Manager must have the responsibility and full authority in his task, whether he is employed by the Client, Consultant or Contractor and must manage his roles and duties. Everyone in the organization must be encouraged to gain

the commitment of their own team by holding a start-up meeting to bring it together. It is the Contractors Project Manager's responsibility to support this course of action.

### **8) Arranging the Start-up Meeting**

Once the previous stages are achieved a meeting must be arranged in the presence of all parties involved in the project to discuss the following:

- Summarize the project objectives in full details with outline and project background
- The scope of work of each specialized of sub-contractors
- The roles and responsibilities of each involved person in the project at that stage
- The development of strategic plan to meet the objectives for the stage
- The necessary practical steps which must be taken top meet the next set of the objectives
- Method of resolving any major identified problem
- How the plan for the final design could be executed.

### **4.4.2 Detailed Design**

Once the briefing and sketch plan is agreed by Client and Consultant, it is not advisable to change anything before starting the design work and drawing. Because in the previous stages, most of the following points should have been finalized:

- Brief must be developed
- Client requirement finalized
- Technical problem discussed
- Full design concept is clear
- Cost plan is prepared

## **1) Engineering Design**

Engineering design is turning the approved design into working information. It should be a distinct phase of the design process beginning once the scheme design has been approved. A clear organizational plan for the Engineering stage of the design is required which should be based on the division of the project into zones, each of which forms an integrated system, for the building. The reason for this is that for the completion of site operations, each system must function properly. The Designer of each system must be obliged to ensure that all the information to enable the system to be completed is available at the designated time, as specified within the programme.

Each design team leader should establish and clearly express a policy for:

- The scope of production information
- The production of information required from specialists.
- The method of co-ordination to ensure the information for construction is complete and workable.
- The information for tendering.

A very specific check list for each package with in each building zone which expresses each of these policy objectives must be presented to keep the Client or Client Representative fully informed, and also ensures the various Consultants have the necessary project overview.

## **2) Production Information**

*"It is important to ensure that the person to whom information is to be given has prepared an adequate description of the requirements so that the designer matches the design to a stated brief"* (Hughes G., 1994). It is the duty of everyone to produce correct information and thus information must be checked by a senior designer such as the followings:

- Are the dimensions complete?

- Are the tolerances practical?
- Are they in accordance with standards?
- Has a build ability analysis been done?
- All the drawings are clear and comply with schedules and specifications.

### **3) Bill of Quantities and Construction Specifications**

The purpose of Bill of Quantity in Bill together with the specifications is to define the Contractors obligations for Quality and Quantity. The Consultant must issue a very precise list for the works required by the Contractor in a sequenced way to enable the quantification of the work items. Together with the specifications and standards, the quantities of the item must comply with the drawings. This is to avoid subsequent construction problem with the Contractor during the execution of the work.

**Gordon A. (1987)** stated that *“Such things are to be specifically controlled by the contract, rather than relying on the terms which would be implied at common law, this is a matter of specifications. This has been defined by coordinating committee for project information of the document or part of document which defines the materials and products to be used, the standard of work required and the conditions under which the work is to be executed”*.

#### **4.4.3 Consultant’s Roles and Obligations on Site**

*“The Consultant or the Resident Engineer on site should have the necessary experience to manage the site technically, legally, financially and contractually. He must know how to coordinate and communicate with Client and Main Contractor as well as the Subcontractors to prevent any delay of project progress” (Alan G et al., 2004).*

The Clients job description including authority, responsibility and powers must be made clear to everyone on site. The Consultants should be fully aware of points listed below:

- The management procedures for documentation system in full details.
- The procedure established in the contract for issuing instructions to Contractors either verbal instructions or written instructions and method of confirming the instructions.
- Method of checking and inspection the work anywhere and any time on site through a proper inspection channel as stated in contract conditions.
- Method of checking the interim certificate of Main Contractor as well as other subjects relates to valuation such as retention amount, pervious amount paid and percentage of work done etc.
- Method of granting the extension of time and other cost implication due to the extension of time and how to deal and treat the variation or additional works with contractors.
- Method of issuing completion certificate and conditions of issuing the handing over certificate, substantial completion certificate, partial completion and partial handing over certificate as per the conditions of contract.
- He must be fully aware of when he can issue the instruction to remove or rectify faulty works.
- He must be fully aware of monitoring the work progress on site as well as following up the execution of work activities.

#### **4.5 CLIENT'S OBLIGATIONS**

**Mardosh J. (1998)** stated that *"Since the Client is the end user of the project, it is very important to pay the Contractor promptly and fully for the work done, and in a certain circumstances to compensate the Contractor for the loss and expenses which may caused by the Client"*.

The Client signs a Contract with a Contractor to build the project on the basis of the approved design by him under conditions and terms prepared by the Consultant. Those conditions must be to the benefit of the project and the Client and they must be prepared in a way that does not disadvantage the Contractor when preparing the tender. The Consultant must be fully aware of the condition of the contract and he

must design the project based on the Client requirements, in detail to enable the Contract Manager to prepare the clauses and conditions in a manner that will avoid any dispute or problem either at the contract tender stage or during the project execution.

There are many clauses in **FIDIC 1987** indicate the responsibilities of the Client such as *Clauses 60.1, 20.4, 60.9 and 21.3*.

#### **4.5.1 Client's Duties**

The Client must be fully aware of the project objective, even if he is not familiar in rules of construction industry. If the Client or his organization does not possess the necessary experience he should appoint a Client's Project Manager working on his behalf who understand and has experience of the management of projects.

The Client's Project Manager is usually an Engineer who knows how to communicate with Consultant, Contractor and Subcontractors, on a technical, legal, contractual and financial basis or has a Project Team that can offer there committed skills. At the design management stages he must inform the Client and get his approval of each stage, explaining to him the benefits or disadvantages at each stage to the project. The Client requirements are paramount and they must be presented to the Consultant to meet the Client requirements. Similarly the Client, or his representative must clearly understand their duties and obligations when setting the design objectives and during construction so as to avoid consequential delays.

##### **1) Payment**

One of the most important of the Client obligation is to pay the Contractor the sum of money which forms the considerations for the Contract, known as the Contract sum. The extent of this obligation is not limited. Client must pay 10% as an advance payment on time of signing the contract and the rest will be distributed as a monthly payment or as per the work done based on a period defined by the Consultant.

## **2) Necessary Nomination**

It is the duty of the Client to nominate the necessary Sub-contractor whom is required to build a specific type of work within a defined period of time (to be agreed on time of signing the contract). Nomination can apply to both Subcontractor and Suppliers or even materials. To avoid any delay for the Contractor, the Consultant has to prepare a list of all the nominations required and provide them to contractor to enable him verify samples, technical data, budget, drawings and set the time, based on the contract programme for the nominated item.

## **3) Site Obligations**

Accordingly to **Holmev G. (1999)**, *"The need to provide the Contractor with possession to the site on time is fundamental to the contract. Failure to do so will cause the employer to forfeit any claim for liquidated damages on the late completion"*. It may render the Client liable to pay compensation to the Contractor. It is always preferable that Client gives possession of the whole of the site from the out set and not in parts, in order to allow the Contractor flexibility to start the work in the most suitable sequence. (The actual area that is to be built together with sufficient surrounding space must be given to the Contractor).

## **4) Insurance**

It is the duty of the Consultant to advise the Client to arrange suitable insurance where necessary, such as whether the work consists entirely of new building or whether existing buildings are involved.

## **5) Method of Measurements**

The Client must know or he should be informed by Consultant that the Bill of Quantities which have prepared is based on the specified standard method of measurements. To avoid extra cost or delay of the project the work must be listed

clearly in a very structured way, all details should be clear and it is preferable to sectionalize in the Bill of Quantities to aid clarity.

## **6) Health and Safety**

The Client of almost any Contractor is responsible for ensuring that a planning supervisor is appointed early in the process and to ensure that no construction work commences until a health and safety plan is in place.

In the Gulf, the health and safety plan must be prepared and submitted along with drawings for final approval through safety and environmental department.

## **4.6 SUMMARY**

This chapter has presented the key issues that the Client, Consultant and Contractor are expected to provide in the context of construction projects in Dubai.

It is important to highlight these issues as failure to comply is likely to be disruptive to the project and, in all probability, cause delay and/or additional project costs.

**Al Otaiba R. (1998)** has confirmed that *“Dubai Government strategy focuses on the development of construction industries by applying all factors of construction and project management which always affecting positively on project success”*.

Having established these key issues, the following chapter progresses to identify delays in the context of what would be a reasonable basis of expected performance requirements from the three main parties to a Project I Dubai.

--- End of Chapter ---



## **CHAPTER 5**

# **IDENTIFICATION OF THE ACCEPTED KEY SOURCES OF PROJECT DELAYS**

## **5.0 INTRODUCTION**

Delay in project completion is widely recognized as a major problem in construction, which often leads to costly disputes and acrimonious relationships between the parties involved. The delayed projects will typically produce financial penalties due to the failure of the achieving the construction project goals. The problem of delays is compounded by the complexities associated with the construction of projects. Although the reasons, factors or causes of delays cannot be fully controlled, many of them could still be avoided to reduce the chances of overall delay.

This chapter presents an investigation to identify the most important causes of delays in construction projects with the traditional procurement approach and the source of that delay. The identified causes of delays will then be discussed in the context of how they can be reduced, from the Contractor's perspective.

### **5.1 COMMON DELAYS CAUSED BY THE CLIENT**

It is very common that change orders are initiated by the Client during his visits to the project in order to meet his own satisfaction, customer's demands or marketing reasons. Without any prior notice an immediate change order could be issued to the Contractor through the Consultant based on the Client's instruction, in some cases even without any official approval for the payment of the additional works. This normally generates impacts on the Contractor's plans. Particularly some change orders can be of a large magnitude, requiring extensive re-design, which affects the cash flow, payment to subcontractors and will disturb the project duration. **Thorvaldsson et al. (2001)** said *"Clients are also accused of being slow in decision making and in many instances, contractors waste resources waiting for owners to decide, (and designers to provide) adequate information on the changes required"*.

According to **Brij B. and Donald F. (1996)**, *"It is indicated that 20 projects out of 24 case studies had an increase in the scope of the work and the causes can be classified as changed conditions from those shown on the Contract documents and the*

*requested additional work beyond the original scope of the work included in the contract".*

This can be manifested by the Client's disrupting the cash flow of the project by delaying payments which consequently disrupts the Contractor's payment to subcontractors. This can cause subcontractors insolvency and may force the main contractor to employ another subcontractor for new works. Inexperienced Clients often expect an unrealistically optimistic expectation for the duration for the project, for design and/or execution. A clear understanding of contractual duties by the Client is important, especially in clearly stating the project objectives in a detailed form. Nominated subcontractors and suppliers are another major cause of delay initiated by the Client. Once the Client assigns any job to a nominated subcontractor, all the options and proposals need to be coordinated with the Consultant during the design stage.

**Thomas E. and Loosemore M. (2004)** stated that *"Clients are the most important group on a project team. Some of them assume of role of a project leader, while others prefer to delegate the leadership role to another party, such as a Project Manager. The degree of their involvement on the project depends on the level of their experience"*. If the Client or his representatives do not have the enough experience of identifying the project objectives and the mission statement of what they think or intend to do, there will be a major cause which will delay process of design and construction. Cost budget, time and quality standards will also be affected. The Client should have the enough experience in communicating with his representatives, financier, legal consultant, the design consultant and other consultant depending on the project needs to reduce any delay which may occur during design or construction. The inability of the Client in communicating directly with the other project participants may create delays.

According to **Latham M. (1994)** *"Clients normally expect their projects to be delivered within budget, on time and to the level of quality required"*. Unfortunately once the construction and operational process starts, the Client or his representative start changing the original design and finishing items which makes it very difficult for the Contractor to hand over the project on the specified time. This results in the

Contractor's Project Manager to compress the programme of the work as much as he can to avoid any progress delay.

One of the major problems caused by the Clients is appointing a Project Manager who does not have enough knowledge and skills across a wide spectrum of project management competencies. Most of the Client's representatives are experts in commercial aspects and are able to make decision on behalf of the Client's but may still they have a lack of experience in design process, tendering, construction activities, cost control and risk management which affects and reflects negatively upon the right decisions required to keep the work progress on schedule. In most of construction projects, the Clients raise funds by borrowing or through financiers such as banks or finance companies. The bank representatives insist on becoming a project team member to have a more direct access to project information and possibly to influence decision making in order to safeguard their investment. This is another problem caused by the Client, once the financier is involved in decision especially related to cash flow, procurement strategy and other decision that relate to technical matters there is a risk it will affect the project performance.

## **5.2 COMMON DELAYS CAUSED BY THE CONSULTANT**

There is a generally well founded belief by contractors, especially project manger that incomplete drawings and contract documents are a major cause of the delay. The majority of delays can be traced to inconsistent or to incomplete detailing of drawings, incorrect dimensions of walls and openings, inadequate detailing of difficult locations and inconsistent detailing. Many contracts were bid on the basis of incompleted information, require extensive changes during construction. **Battaineh H. (2002)** stated that *"unqualified design Engineers are sharing the work on the drawing which effects the quality and quantity of the work. Another major factor of delays caused by the Consultant is the inability of effectively managing and preparing the contract document including bill of quantities and the approved drawings which creates a large margin of errors and omission in quantities"*.

Poor appreciation of the design management process is another factor that causes delay by the Consultant. This is manifested by:

- a) Limit experience of the process of building design,
- b) Not understanding project objects in detail,
- c) Lack of appreciation of the complexity of design,
- d) Lack of control of the design development, and
- e) Insufficient attention to the design interfaces.

According to **Edwin H. (2005)** *"the design responsibility is transferred from the owner organisation to the Consultant who is responsible for the design management in the Project and to be delivered by the design procedure system"*.

Failure of transmitting the Client's requirements and the project objectives to design aspects and criteria along with technical specifications through a proper coordination between the Client's representatives and the Consultant manager causes a major problem in the design progress.

**Mustafa F. (1998)** stated that *"Selecting the contract type and procurement method is a major problem to a project if the consultant is not able to know how and when to choose the type of the contract required to suit the project"*.

Lack of information about the type of contracts, the conditions of contracts, major design issues, standard specifications and major design criteria to managers and engineers who works in consultant offices *"are one of the major problems that construction industry sector in UAE is still suffering and generates many problems during the execution"* (**Al Jamal I., 2008**).

Inspection process during the work operations, the approval process duration of submittals and approvals of project materials and the technical site experience of the inspector who gets the instruction from the Consultant resident engineer are also factors attributes the project delay.

According to **Trigunarsha B. (2004)**, *"Many construction projects are awarded on a competitive basis using the traditional approach. In this approach, professional designers and contractors are engaged in separate contracts. The contractors are usually not involved until the designs have been completed. The separation of design from production in the construction process had led to a certain amount of isolation of the professionals from technical development in construction industry"*. This could be a reason for projects exceeding budgets and deadlines. Improving constructability of construction projects is the responsibility of all parties who are involved in the project especially during design. Constructability or the approval of construction methodology is directly related to appropriate design.

In most of the Consultant offices, the roles and the responsibilities of design leader, architect, structural engineer, and quantity surveyor are always not specified which creates a major problem in drawings, the conditions of contract, bill of quantities, and particular specifications of projects. Many problems occur in schematic and detailed design where conflicts between structural and services drawings becomes the norm. This creates difficulties in getting the approval of the final detailed design and other tender documents from state authorities.

### **5.3 COMMON DELAYS CAUSED BY THE CONTRACTOR**

The blame for most project delays is frequently attributed to the Contractor. Some delays could be better controlled or probably avoided by the Contractor. But some factors are out of the Contractor's control such as obtaining building permits by the Consultant issued by government agencies, the nature of site and some other unexpected factors (weather conditions). Incorporation of such items into a construction programme are difficult. Pressure to win a contract may result in these risks being underestimated.

**Al Momeni A. (2000)** stated that *"some of the common factors which contribute to the project delay are the poor design, negligence of the owner, change orders, late delivery, site condition and increase in the quantities"*.

**Chan D. and Kumaraswamy M. (1995)** concluded " *other normal factors of the project delays are the project complexity, quality level required, type and style of management, overall organisational structure, types of contract and communication of Project Manager with his staff, consultant and Client*".

In traditional contracts, the Contractor's responsibility is to build the project according to the contract documentations within the required cost and time budgets and the specified standards. The execution of the contract is administrated by the Contractor's Project Manager who should have the qualified technical staff, enough resources along with a group of experienced subcontractors.

One of the major common delays caused by the Contractor is the mis-coordination with the domestic and nominated subcontractors. Many factors contribute to the project delay from by Contractor as an organisation these major factors could be grouped under the following headings:

- 1) Tender department of the Contractor,
- 2) Contractor's Project Manager roles, responsibilities and authorities during the pre-construction stage and construction process (operational process),
- 3) Centralised policy of contractor top management, and
- 4) Sub-Contractor appointments

**John F. and Woodward P. (1997)** stated that "*the management of the Project Manager in construction projects depends upon the nature of project and the position in which the Project Manager is placed. While the first major responsibility will be to define the scope and the content of the project. The Project Manager will have to be experienced in the type of the project and will have to be sufficiently strong character to instruct the team of their responsibilities*".

The four major factors listed above affects the project progress during construction in the following ways.

- 1) The Contractor's tender department:
  - Lack of experience in checking the contract and tender document.

- No proper coordination with the Consultant on queries.
  - Lack of experience of raising technical inquiries during bidding, tendering and tender drawings verifications.
  - Failure of tender department of specifying the risk in temporary works for the project.
  - The wrong analysis of the rates for some items in bill of quantity.
  - Failure of the team in tender department in comparing the items listed in bill of quantities with the tender drawings and contract specifications.
- 2) The Contractor's Project Manager's roles, responsibilities and authorities during pre-construction and construction processes:
- Not familiar in the type of the contract and the contract conditions.
  - Not very familiar in FIDIC roles
  - No time to revise the contract documents
  - Do not have the enough experience of quality control & quality procedures
  - Do not have the enough time to prepare the construction Methodology. For the planning of the work in sequence wise.
  - Do not have the enough physical and human resources for a proper organisation
  - The tied schedule of project delivery date
  - Project finance
- 3) Centralised Policy of the Contractor's Top Management:
- Delays the urgent Decision taken by the Contractor's Project Manager to avoid the probable delay (which some times relates to financial issues)
  - Appointing the unqualified technical staff for working on the site to help the Contractor's Project Manager (some time he do not have the authority on them or in other words he can not control them)
  - Direct negotiations with their partner subcontractors without referring to the Contractor's Project Manager on the site.

**Egan J. (1998)** stated that *"partnering relationship can be developed between Client, consultant, Contractors and sub contractors"*. It is necessary to establish the partnering relationship where the Contractor's project manager can have the authority to discuss and negotiate many issues relates to he some items in the subcontract



agreement. **Greenwood D. (2001)** stated *"The relationship between contractors and subcontractor remained traditional"* This is to help both of them to execute their obligations through the conditions of the subcontract agreement while **Constantino N. (2001)** stated that *"The main reason for subcontracting is the need for reducing liability exposure because of increasing claims and legal actions and as a way to shift risks and uncertainties"*.

- Weak relationship between the project team and the management due to the bad performance of the team on site.

**Atkins B. (2001)** stated that *"The subject of the Contractor team performance extends beyond many traditional measures and should include the development of harmonious relationships with the top management in spite of any problem"*.

- Delays of releasing the certified monthly payment of the subcontractor
- Delays of solving any issue or problem raised by the Contractor's Project Manager
- Not giving any chances to Contractor's Project Manager to give his point of view about the project during tendering and construction (technical and financial issues)

#### 4) Sub-Contractors

- Submitting their quotations without understanding their scope of work in full details.
- Not finalising the financial issues in time
- Not submitting the necessary technical information of samples as per standards
- Do not have the enough qualified resources to handover the job on time

In addition to the major points listed above which affects the project progress and caused by the Contractor, there are many issues facing the Contractor's Project Manager while executing the project such as the lack of communication between him and the Consultant due to cultural factors (e.g. age, experience, language, trust and personality). A bad contractual relationship is often indicated by disputes and long

negotiation which often causes major delay to the project. This can also be a reflection on the Contractor's Project Manager's capabilities.

#### **5.4 OTHER SOURCES FOR DELAY FACTORS**

Working in a city like Dubai, in common with main urban sites, means having to encounter problems such as lack of storage space, accommodation, material transportation, restricted plant movement which relates to heavy transport problem and traffic regulations. This can affect work progress through such factors as the supply of concrete, which can cause major problems.

Third parties affected by the project can also be a major cause for the stoppage of the work due to the needs for working space for equipment, such as parking, tower cranes, material loading and offloading.

Regulations in Dubai are very restrictive due to limitations on healthy and safety of the construction, work force and neighbours. This can cause delays associated with regulation compliance and many contractors do not make adequate allowance for this kind of delay when evaluating the project. Special permits required for the project (e.g. water, electricity, telephone, street lightning, drainage, roads and environment) have to be obtained from authorities for substructure and superstructure works, which takes time.

Unforeseen factors, such as finding an unrecorded mass of concrete in the ground, especially if the work scope is establishing a two basement underground is extremely disruptive. Breaking or removing this mass concrete will inevitably cause delays.

Shortage of materials also causes a major delay for work progress especially within a period of high market demand. Cement and steel reinforced must always be planned to be available during construction in order avoid delay in progress.

**Naief M. (2002)** stated that *"Other causes of delay are attributed to improper management of materials and hampered by lack of explicit and detail model of project materials management process"*.

In Dubai the construction market has been booming for many years. This makes the market one of high resource demand. Qualified Contractor's Project Manager, engineers, skilled labourers and professional Subcontractor are not always available on request; this affects the technical side of the project performance of work quality which delays progress.

As noted in Section 2.2, the majority of the work force in construction projects in Dubai is expatriot, (mainly Indian), and many of them go back to their country on short vacation but often stay longer than that which they requested. This affects the work progress since it is not easy to replace them due to restrictions on visas and labour rules and regulations.

Many construction companies in Dubai rely on labour suppliers due to the shortage of manpower in the market. The government restricts on the issuance of work permits to labourers (A cultural factor and to maximise the employment of nationals). These labour suppliers are not reliable in time, quality and quantity of supply because they transfer labourer to another sites to maximise their profit.

Some contractual factors causing delays are precipitated by the Consultant and the Client such as the nominated Subcontractors and provisional items. Most of the Contractors find it difficult with these two items. The period required for furnishing the information, approval of samples by the Client, the Conditions of Sub-contract Agreement with nominated Subcontractor (financial and contractual terms) leads both parties into long negotiations, disputes and delay in project progress.

**Chan D. and Kumaraswamy M. (1997)** identified five principal delay factors *"Poor risk management, poor supervision, unforeseen site conditions, slow decision making involving variation and necessary variation works"*. It appears that some of the found factors of delay are similar to the factors discussed in the previous sections of this chapter. This indicates the mentality of the project participants, and the way they

think during the design and the construction, which should be rectified and corrected to avoid and mitigate the delay.

## **5.5 DELAYS CAUSED BY THE CONTRACTOR'S PROJECT MANAGER & PROJECT TEAM MEMBERS**

In the traditional procurement approach, the Contractor's Project Manager is the person who has the overall responsibility for the successful planning and execution of a project. One of his responsibilities is "meeting the project target" by achieving the completion of the project within time under budget and in accordance with the required performance and quality level. The question is "Is every Contractor's Project Manager capable to fulfil this responsibility?" In most of construction projects in Dubai, many factors affect the efficiency and performance of the Contractor's Project Manager of carrying out his duties as it should be to achieve the project targets. Some of these factors are listed as the followings (**Anderson W., 1997**):

- Lack of experience in contract terminologies and wrong interpretation of contract terms,
- Lack of information's in condition of contract (Traditional type),
- Developing the methodology of the construction of the Project without any assistance from the tender department,
- Do not have the enough experience in type of the Project he assigned for (due to the unique architectural and structural features of the project),
- Do not have the enough authority to hire or appoint the necessary team to execute the work or even to negotiate the contractual and the financial issues of any sub-contract agreement for the subcontractors,
- Difficulties in communication with the technical site staff or the Consultant resident engineer due to many reasons, i.e. cultural factors, traditional factors, language problems, age and environment factors, and
- The uncertainty in any decision due to the centralised policy of the management. (In some firms, the Contractor's Project Manager may loose his job if he makes a decision without referring to the top management).

The next important task of the Contractor's Project Manager, which links directly to his responsibilities, is to set up the project team who are qualified enough to work along with him.

It will reflect the work progress and the project handing over date will be extended. Some of negative points of the team members are listed as follows (**Anderson W., 1997**).

- Appointing one or two professional engineers on the site to monitor all work activities in one time while the Project needs seven to eight engineers to fulfil the approved organisation structure.
- Most of the team members including staff do not have enough experience in contracts and the conditions of contract.
- Less knowledge of appropriate planning methods which is very essential.
- Feedback data and necessary information always collected and reported to the Contractor's Project Manager by a junior member. Who can't predict and estimate properly due to the lack of their experience.
- The weak experience of the staff in cost control issues
- Skills of internal communications, reporting and documentation are poor in some projects long with resource levelling.
- Poor planned who do not have the enough experience in planning and programming. The most important person in the project working with the Contractor's Project Manager to prepare the detailed working coordinated programme and keep up dating it on weekly basis along with the resource loading is the qualified planner.

**Sawyer G. (2001)** stated that *"The programme as stated in the tender documents, is limited to the number of days forming the time for completion, as given in the Appendix, where the works are to be completed in sections or parts, the number of days for the time for completion such sections or parts will also be given."*

The above listed factors, caused by the Contractor's Project Manager or his team, creates uncertainty, a situation where risks cannot be controlled which undermines the control of the Contractor's Project Manager and his team over the Project.

## **5.6 DELAY FACTORS CAUSED BY PROJECT ITSELF**

**Hughes W. (1998)** stated that *"Many projects suffer from inadequate or inappropriate procurement decisions". Sometimes the Contractor will be forced to compress the programme of the project duration because the policy for choosing a procurement strategy for the project is not correct since the type and the size of the project does not suit type of contract"*.

If the project type is unique and the Contractors are not very familiar with this type of project, this can create great pressure on the Contractor and will become a critical factor to cause delay. Meantime the performance of the Contractor's Project Manager on the job is heavily influenced by the uniqueness of the activities.

**Belassi W. and Tukel O. (2001)** stated that *"The more standard activities a project has the easier it is for the project manager to plan, schedule and monitor their projects. Another characteristic, which needs to be emphasized, is project density. This is defined as the ratio of total number of precedence relationship to the total number of activities. The allocation resources, especially man-hours are affected by the density. Due to the resources constraints, Contractor's Project Manager are often forced to use overtime, which jeopardizes budget performance or are forced to delay activities competing for the same resource, which results in delays in project completion times"*.

If the Client or his representatives appointed an international contractor, who is only recently established in Dubai, to develop their project which has a unique architectural features using inexperienced local subcontractors, it is likely to cause major problem to all participants. Unless they build a good relationship based on trust, good communication and good atmosphere the problems will remain. As **Latham M. and Egan J. (1998)** stated that *"construction projects are undertaken by a broad range of companies and individuals who work together on a temporary basis, during which their performance may interact. Relationship among project participants may be adverse because of their conflicting interest, ways must be found to eliminate the mistrust and merge the participant's interest to form collaborating working relationship"*

## **5.7 SUMMARY**

This chapter reviewed the major common causes of delays in construction projects from different perspectives (i.e. the three major participants, external factors, and project limitations). It also discussed the delay caused by the Contractor's Project Manager and his team. Understanding such causes sets the basis for the further studies in this research. For example,

- The major causes of delays being responsible by the Client include: regular interference and poor communication, variations, late approval for payment, late supply of information and decision making, unclear project objectives, nomination of Sub-Contractors & Suppliers, many provisional sums and prime cost, unrealistic project duration, irregular payments to contractor, and irregular attending of site meetings.
- The major causes of delays being responsible by the Consultant include: incomplete contract documents, incomplete drawings, Weak design management, late approval to the Contractor's shop drawings, duration of inspection, incompetent site staff, poor communication with the Contractor and the Client, poor quality control, inadequate response to technical enquiry, and changes in drawings and specifications.
- The reasons for project delays caused by the Contract are much complex. More than 20 reasons have been reviewed which include: inappropriate organization chart, incompetent staff, poor communication and coordination with other project participants, inadequate resources, poor quality control, congested site, mistakes during construction, late delivery of material, shortage of manpower, productivity of manpower, poor financing, late payments, poor site investigation, culture impacts, preparing the method statement for each work activity, etc.

The major delay factors identified in this chapter are expressed in tabular form in Chapter 6, and are used as the basis for formulating a questionnaire used to evaluate their occurrence in Dubai.

--- End of Chapter ---

## **CHAPTER 5**

# **IDENTIFICATION OF THE ACCEPTED KEY SOURCES OF PROJECT DELAYS**



## **5.0 INTRODUCTION**

Delay in project completion is widely recognized as a major problem in construction, which often leads to costly disputes and acrimonious relationships between the parties involved. The delayed projects will typically produce financial penalties due to the failure of the achieving the construction project goals. The problem of delays is compounded by the complexities associated with the construction of projects. Although the reasons, factors or causes of delays cannot be fully controlled, many of them could still be avoided to reduce the chances of overall delay.

This chapter presents an investigation to identify the most important causes of delays in construction projects with the traditional procurement approach and the source of that delay. The identified causes of delays will then be discussed in the context of how they can be reduced, from the Contractor's perspective.

### **5.1 COMMON DELAYS CAUSED BY THE CLIENT**

It is very common that change orders are initiated by the Client during his visits to the project in order to meet his own satisfaction, customer's demands or marketing reasons. Without any prior notice an immediate change order could be issued to the Contractor through the Consultant based on the Client's instruction, in some cases even without any official approval for the payment of the additional works. This normally generates impacts on the Contractor's plans. Particularly some change orders can be of a large magnitude, requiring extensive re-design, which affects the cash flow, payment to subcontractors and will disturb the project duration. **Thorvaldsson et al. (2001)** said *"Clients are also accused of being slow in decision making and in may instances, contractors waste resources waiting for owners to decide, (and designers to provide) adequate information on the changes required"*.

According to **Brij B. and Donald F. (1996)**, *"It is indicated that 20 projects out of 24 case studies had an increase in the scope of the work and the causes can be classified as changed conditions from those shown on the Contract documents and the*

*requested additional work beyond the original scope of the work included in the contract".*

This can be manifested by the Client's disrupting the cash flow of the project by delaying payments which consequently disrupts the Contractor's payment to subcontractors. This can cause subcontractors insolvency and may force the main contractor to employ another subcontractor for new works. Inexperienced Clients often expect an unrealistically optimistic expectation for the duration for the project, for design and/or execution. A clear understanding of contractual duties by the Client is important, especially in clearly stating the project objectives in a detailed form. Nominated subcontractors and suppliers are another major cause of delay initiated by the Client. Once the Client assigns any job to a nominated subcontractor, all the options and proposals need to be coordinated with the Consultant during the design stage.

**Thomas E. and Loosemore M. (2004)** stated that *"Clients are the most important group on a project team. Some of them assume of role of a project leader, while others prefer to delegate the leadership role to another party, such as a Project Manager. The degree of their involvement on the project depends on the level of their experience"*. If the Client or his representatives do not have the enough experience of identifying the project objectives and the mission statement of what they think or intend to do, there will be a major cause which will delay process of design and construction. Cost budget, time and quality standards will also be affected. The Client should have the enough experience in communicating with his representatives, financier, legal consultant, the design consultant and other consultant depending on the project needs to reduce any delay which may occur during design or construction. The inability of the Client in communicating directly with the other project participants may create delays.

According to **Latham M. (1994)** *"Clients normally expect their projects to be delivered within budget, on time and to the level of quality required"*. Unfortunately once the construction and operational process starts, the Client or his representative start changing the original design and finishing items which makes it very difficult for the Contractor to hand over the project on the specified time. This results in the

Contractor's Project Manager to compress the programme of the work as much as he can to avoid any progress delay.

One of the major problems caused by the Clients is appointing a Project Manager who does not have enough knowledge and skills across a wide spectrum of project management competencies. Most of the Client's representatives are experts in commercial aspects and are able to make decision on behalf of the Client's but may still they have a lack of experience in design process, tendering, construction activities, cost control and risk management which affects and reflects negatively upon the right decisions required to keep the work progress on schedule. In most of construction projects, the Clients raise funds by borrowing or through financiers such as banks or finance companies. The bank representatives insist on becoming a project team member to have a more direct access to project information and possibly to influence decision making in order to safeguard their investment. This is another problem caused by the Client, once the financier is involved in decision especially related to cash flow, procurement strategy and other decision that relate to technical matters there is a risk it will affect the project performance.

## **5.2 COMMON DELAYS CAUSED BY THE CONSULTANT**

There is a generally well founded belief by contractors, especially project manger that incomplete drawings and contract documents are a major cause of the delay. The majority of delays can be traced to inconsistent or to incomplete detailing of drawings, incorrect dimensions of walls and openings, inadequate detailing of difficult locations and inconsistent detailing. Many contracts were bid on the basis of incompleted information, require extensive changes during construction. **Battaineh H. (2002)** stated that *"unqualified design Engineers are sharing the work on the drawing which effects the quality and quantity of the work. Another major factor of delays caused by the Consultant is the inability of effectively managing and preparing the contract document including bill of quantities and the approved drawings which creates a large margin of errors and omission in quantities"*.

Poor appreciation of the design management process is another factor that causes delay by the Consultant. This is manifested by:

- a) Limit experience of the process of building design,
- b) Not understanding project objects in detail,
- c) Lack of appreciation of the complexity of design,
- d) Lack of control of the design development, and
- e) Insufficient attention to the design interfaces.

According to **Edwin H. (2005)** *"the design responsibility is transferred from the owner organisation to the Consultant who is responsible for the design management in the Project and to be delivered by the design procedure system"*.

Failure of transmitting the Client's requirements and the project objectives to design aspects and criteria along with technical specifications through a proper coordination between the Client's representatives and the Consultant manager causes a major problem in the design progress.

**Mustafa F. (1998)** stated that *"Selecting the contract type and procurement method is a major problem to a project if the consultant is not able to know how and when to choose the type of the contract required to suit the project"*.

Lack of information about the type of contracts, the conditions of contracts, major design issues, standard specifications and major design criteria to managers and engineers who works in consultant offices *"are one of the major problems that construction industry sector in UAE is still suffering and generates many problems during the execution"* (**Al Jamal I., 2008**).

Inspection process during the work operations, the approval process duration of submittals and approvals of project materials and the technical site experience of the inspector who gets the instruction from the Consultant resident engineer are also factors attributes the project delay.

According to **Trigunarsha B. (2004)**, *"Many construction projects are awarded on a competitive basis using the traditional approach. In this approach, professional designers and contractors are engaged in separate contracts. The contractors are usually not involved until the designs have been completed. The separation of design from production in the construction process had led to a certain amount of isolation of the professionals from technical development in construction industry"*. This could be a reason for projects exceeding budgets and deadlines. Improving constructability of construction projects is the responsibility of all parties who are involved in the project especially during design. Constructability or the approval of construction methodology is directly related to appropriate design.

In most of the Consultant offices, the roles and the responsibilities of design leader, architect, structural engineer, and quantity surveyor are always not specified which creates a major problem in drawings, the conditions of contract, bill of quantities, and particular specifications of projects. Many problems occur in schematic and detailed design where conflicts between structural and services drawings becomes the norm. This creates difficulties in getting the approval of the final detailed design and other tender documents from state authorities.

### **5.3 COMMON DELAYS CAUSED BY THE CONTRACTOR**

The blame for most project delays is frequently attributed to the Contractor. Some delays could be better controlled or probably avoided by the Contractor. But some factors are out of the Contractor's control such as obtaining building permits by the Consultant issued by government agencies, the nature of site and some other unexpected factors (weather conditions). Incorporation of such items into a construction programme are difficult. Pressure to win a contract may result in these risks being underestimated.

**Al Momeni A. (2000)** stated that *"some of the common factors which contribute to the project delay are the poor design, negligence of the owner, change orders, late delivery, site condition and increase in the quantities"*.

**Chan D. and Kumaraswamy M. (1995)** concluded " *other normal factors of the project delays are the project complexity, quality level required, type and style of management, overall organisational structure, types of contract and communication of Project Manager with his staff, consultant and Client*".

In traditional contracts, the Contractor's responsibility is to build the project according to the contract documentations within the required cost and time budgets and the specified standards. The execution of the contract is administrated by the Contractor's Project Manager who should have the qualified technical staff, enough resources along with a group of experienced subcontractors.

One of the major common delays caused by the Contractor is the mis-coordination with the domestic and nominated subcontractors. Many factors contribute to the project delay from by Contractor as an organisation these major factors could be grouped under the following headings:

- 1) Tender department of the Contractor,
- 2) Contractor's Project Manager roles, responsibilities and authorities during the pre-construction stage and construction process (operational process),
- 3) Centralised policy of contractor top management, and
- 4) Sub-Contractor appointments

**John F. and Woodward P. (1997)** stated that "*the management of the Project Manager in construction projects depends upon the nature of project and the position in which the Project Manager is placed. While the first major responsibility will be to define the scope and the content of the project. The Project Manager will have to be experienced in the type of the project and will have to be sufficiently strong character to instruct the team of their responsibilities*".

The four major factors listed above affects the project progress during construction in the following ways.

- 1) The Contractor's tender department:
  - Lack of experience in checking the contract and tender document.

- No proper coordination with the Consultant on queries.
  - Lack of experience of raising technical inquiries during bidding, tendering and tender drawings verifications.
  - Failure of tender department of specifying the risk in temporary works for the project.
  - The wrong analysis of the rates for some items in bill of quantity.
  - Failure of the team in tender department in comparing the items listed in bill of quantities with the tender drawings and contract specifications.
- 2) The Contractor's Project Manager's roles, responsibilities and authorities during pre-construction and construction processes:
- Not familiar in the type of the contract and the contract conditions.
  - Not very familiar in FIDIC roles
  - No time to revise the contract documents
  - Do not have the enough experience of quality control & quality procedures
  - Do not have the enough time to prepare the construction Methodology. For the planning of the work in sequence wise.
  - Do not have the enough physical and human resources for a proper organisation
  - The tied schedule of project delivery date
  - Project finance
- 3) Centralised Policy of the Contractor's Top Management:
- Delays the urgent Decision taken by the Contractor's Project Manager to avoid the probable delay (which some times relates to financial issues)
  - Appointing the unqualified technical staff for working on the site to help the Contractor's Project Manager (some time he do not have the authority on them or in other words he can not control them)
  - Direct negotiations with their partner subcontractors without referring to the Contractor's Project Manager on the site.

**Egan J. (1998)** stated that *"partnering relationship can be developed between Client, consultant, Contractors and sub contractors"*. It is necessary to establish the partnering relationship where the Contractor's project manager can have the authority to discuss and negotiate many issues relates to he some items in the subcontract

agreement. **Greenwood D. (2001)** stated *"The relationship between contractors and subcontractor remained traditional"* This is to help both of them to execute their obligations through the conditions of the subcontract agreement while **Constantino N. (2001)** stated that *"The main reason for subcontracting is the need for reducing liability exposure because of increasing claims and legal actions and as a way to shift risks and uncertainties"*.

- Weak relationship between the project team and the management due to the bad performance of the team on site.

**Atkins B. (2001)** stated that *"The subject of the Contractor team performance extends beyond many traditional measures and should include the development of harmonious relationships with the top management in spite of any problem"*.

- Delays of releasing the certified monthly payment of the subcontractor
- Delays of solving any issue or problem raised by the Contractor's Project Manager
- Not giving any chances to Contractor's Project Manager to give his point of view about the project during tendering and construction (technical and financial issues)

#### 4) Sub-Contractors

- Submitting their quotations without understanding their scope of work in full details.
- Not finalising the financial issues in time
- Not submitting the necessary technical information of samples as per standards
- Do not have the enough qualified resources to handover the job on time

In addition to the major points listed above which affects the project progress and caused by the Contractor, there are many issues facing the Contractor's Project Manager while executing the project such as the lack of communication between him and the Consultant due to cultural factors (e.g. age, experience, language, trust and personality). A bad contractual relationship is often indicated by disputes and long



negotiation which often causes major delay to the project. This can also be a reflection on the Contractor's Project Manager's capabilities.

#### **5.4 OTHER SOURCES FOR DELAY FACTORS**

Working in a city like Dubai, in common with main urban sites, means having to encounter problems such as lack of storage space, accommodation, material transportation, restricted plant movement which relates to heavy transport problem and traffic regulations. This can affect work progress through such factors as the supply of concrete, which can cause major problems.

Third parties affected by the project can also be a major cause for the stoppage of the work due to the needs for working space for equipment, such as parking, tower cranes, material loading and offloading.

Regulations in Dubai are very restrictive due to limitations on healthy and safety of the construction, work force and neighbours. This can cause delays associated with regulation compliance and many contractors do not make adequate allowance for this kind of delay when evaluating the project. Special permits required for the project (e.g. water, electricity, telephone, street lightning, drainage, roads and environment) have to be obtained from authorities for substructure and superstructure works, which takes time.

Unforeseen factors, such as finding an unrecorded mass of concrete in the ground, especially if the work scope is establishing a two basement underground is extremely disruptive. Breaking or removing this mass concrete will inevitably cause delays.

Shortage of materials also causes a major delay for work progress especially within a period of high market demand. Cement and steel reinforced must always be planned to be available during construction in order avoid delay in progress.

**Naief M. (2002)** stated that *"Other causes of delay are attributed to improper management of materials and hampered by lack of explicit and detail model of project materials management process"*.

In Dubai the construction market has been booming for many years. This makes the market one of high resource demand. Qualified Contractor's Project Manager, engineers, skilled labourers and professional Subcontractor are not always available on request; this affects the technical side of the project performance of work quality which delays progress.

As noted in Section 2.2, the majority of the work force in construction projects in Dubai is expatriot, (mainly Indian), and many of them go back to their country on short vacation but often stay longer than that which they requested. This affects the work progress since it is not easy to replace them due to restrictions on visas and labour rules and regulations.

Many construction companies in Dubai rely on labour suppliers due to the shortage of manpower in the market. The government restricts on the issuance of work permits to labourers (A cultural factor and to maximise the employment of nationals). These labour suppliers are not reliable in time, quality and quantity of supply because they transfer labourer to another sites to maximise their profit.

Some contractual factors causing delays are precipitated by the Consultant and the Client such as the nominated Subcontractors and provisional items. Most of the Contractors find it difficult with these two items. The period required for furnishing the information, approval of samples by the Client, the Conditions of Sub-contract Agreement with nominated Subcontractor (financial and contractual terms) leads both parties into long negotiations, disputes and delay in project progress.

**Chan D. and Kumaraswamy M. (1997)** identified five principal delay factors *"Poor risk management, poor supervision, unforeseen site conditions, slow decision making involving variation and necessary variation works"*. It appears that some of the found factors of delay are similar to the factors discussed in the previous sections of this chapter. This indicates the mentality of the project participants, and the way they

think during the design and the construction, which should be rectified and corrected to avoid and mitigate the delay.

## **5.5 DELAYS CAUSED BY THE CONTRACTOR'S PROJECT MANAGER & PROJECT TEAM MEMBERS**

In the traditional procurement approach, the Contractor's Project Manager is the person who has the overall responsibility for the successful planning and execution of a project. One of his responsibilities is "meeting the project target" by achieving the completion of the project within time under budget and in accordance with the required performance and quality level. The question is "Is every Contractor's Project Manager capable to fulfil this responsibility?" In most of construction projects in Dubai, many factors affect the efficiency and performance of the Contractor's Project Manager of carrying out his duties as it should be to achieve the project targets. Some of these factors are listed as the followings (**Anderson W., 1997**):

- Lack of experience in contract terminologies and wrong interpretation of contract terms,
- Lack of information's in condition of contract (Traditional type),
- Developing the methodology of the construction of the Project without any assistance from the tender department,
- Do not have the enough experience in type of the Project he assigned for (due to the unique architectural and structural features of the project),
- Do not have the enough authority to hire or appoint the necessary team to execute the work or even to negotiate the contractual and the financial issues of any sub-contract agreement for the subcontractors,
- Difficulties in communication with the technical site staff or the Consultant resident engineer due to many reasons, i.e. cultural factors, traditional factors, language problems, age and environment factors, and
- The uncertainty in any decision due to the centralised policy of the management. (In some firms, the Contractor's Project Manager may loose his job if he makes a decision without referring to the top management).

The next important task of the Contractor's Project Manager, which links directly to his responsibilities, is to set up the project team who are qualified enough to work along with him.

It will reflect the work progress and the project handing over date will be extended. Some of negative points of the team members are listed as follows (**Anderson W., 1997**).

- Appointing one or two professional engineers on the site to monitor all work activities in one time while the Project needs seven to eight engineers to fulfil the approved organisation structure.
- Most of the team members including staff do not have enough experience in contracts and the conditions of contract.
- Less knowledge of appropriate planning methods which is very essential.
- Feedback data and necessary information always collected and reported to the Contractor's Project Manager by a junior member. Who can't predict and estimate properly due to the lack of their experience.
- The weak experience of the staff in cost control issues
- Skills of internal communications, reporting and documentation are poor in some projects long with resource levelling.
- Poor planned who do not have the enough experience in planning and programming. The most important person in the project working with the Contractor's Project Manager to prepare the detailed working coordinated programme and keep up dating it on weekly basis along with the resource loading is the qualified planner.

**Sawyer G. (2001)** stated that *"The programme as stated in the tender documents, is limited to the number of days forming the time for completion, as given in the Appendix, where the works are to be completed in sections or parts, the number of days for the time for completion such sections or parts will also be given."*

The above listed factors, caused by the Contractor's Project Manager or his team, creates uncertainty, a situation where risks cannot be controlled which undermines the control of the Contractor's Project Manager and his team over the Project.

## **5.6 DELAY FACTORS CAUSED BY PROJECT ITSELF**

**Hughes W. (1998)** stated that *"Many projects suffer from inadequate or inappropriate procurement decisions". Sometimes the Contractor will be forced to compress the programme of the project duration because the policy for choosing a procurement strategy for the project is not correct since the type and the size of the project does not suit type of contract"*.

If the project type is unique and the Contractors are not very familiar with this type of project, this can create great pressure on the Contractor and will become a critical factor to cause delay. Meantime the performance of the Contractor's Project Manager on the job is heavily influenced by the uniqueness of the activities.

**Belassi W. and Tukel O. (2001)** stated that *"The more standard activities a project has the easier it is for the project manager to plan, schedule and monitor their projects. Another characteristic, which needs to be emphasized, is project density. This is defined as the ratio of total number of precedence relationship to the total number of activities. The allocation resources, especially man-hours are affected by the density. Due to the resources constraints, Contractor's Project Manager are often forced to use overtime, which jeopardizes budget performance or are forced to delay activities competing for the same resource, which results in delays in project completion times"*.

If the Client or his representatives appointed an international contractor, who is only recently established in Dubai, to develop their project which has a unique architectural features using inexperienced local subcontractors, it is likely to cause major problem to all participants. Unless they build a good relationship based on trust, good communication and good atmosphere the problems will remain. As **Latham M. and Egan J. (1998)** stated that *"construction projects are undertaken by a broad range of companies and individuals who work together on a temporary basis, during which their performance may interact. Relationship among project participants may be adverse because of their conflicting interest, ways must be found to eliminate the mistrust and merge the participant's interest to form collaborating working relationship"*

## **5.7 SUMMARY**

This chapter reviewed the major common causes of delays in construction projects from different perspectives (i.e. the three major participants, external factors, and project limitations). It also discussed the delay caused by the Contractor's Project Manager and his team. Understanding such causes sets the basis for the further studies in this research. For example,

- The major causes of delays being responsible by the Client include: regular interference and poor communication, variations, late approval for payment, late supply of information and decision making, unclear project objectives, nomination of Sub-Contractors & Suppliers, many provisional sums and prime cost, unrealistic project duration, irregular payments to contractor, and irregular attending of site meetings.
- The major causes of delays being responsible by the Consultant include: incomplete contract documents, incomplete drawings, Weak design management, late approval to the Contractor's shop drawings, duration of inspection, incompetent site staff, poor communication with the Contractor and the Client, poor quality control, inadequate response to technical enquiry, and changes in drawings and specifications.
- The reasons for project delays caused by the Contract are much complex. More than 20 reasons have been reviewed which include: inappropriate organization chart, incompetent staff, poor communication and coordination with other project participants, inadequate resources, poor quality control, congested site, mistakes during construction, late delivery of material, shortage of manpower, productivity of manpower, poor financing, late payments, poor site investigation, culture impacts, preparing the method statement for each work activity, etc.

The major delay factors identified in this chapter are expressed in tabular form in Chapter 6, and are used as the basis for formulating a questionnaire used to evaluate their occurrence in Dubai.

--- End of Chapter ---

## **CHAPTER 6**

# **QUESTIONNAIRE SURVEY, FORMULATION AND RESULTS**

## **6.0 INTRODUCTION**

Having established from Chapter 5 the perceived major causes of delay to projects, it is necessary to determine if they are applicable to projects in Dubai.

This chapter presents the questionnaire survey, formulation and results analysis. From the existing literature about the causes of project delays in the developed countries and Dubai in the UAE (Chapters 4 and 5), it was possible to identify the major variables causing project delays and cost overruns. These major causes of delay are the basis used for a questionnaire survey, and are listed in Table 6-1.

The distribution of questionnaire covers a wide geographical area and thus enabled the Author to collect data from a wide variety of professionals who work in the same field and operate with different contracting organizations. It also offers a quick method of returning the required information within the required time.

Randomly selected contractors were chosen to assess the severity of impact of potential delay causes. The Contractor's Project Managers and the site engineers were also questioned and interviewed. The questionnaire derived from the results of the literature review provided each respondent with an opportunity to express their opinion about the major causes based on the list of the questions listed on Table 6-1, by responding the scale from 1% to 100% based on the severity weighting scale shown in Table 1-1 of Chapter 1, Section 1.4.3.2.

### **6.1 QUESTIONNAIRE DESIGN AND DATA COLLECTION.**

In the previous chapters, the Author has summarised the primary anticipated causes of delay in construction projects. The objective of this chapter is to collect primary data in order to establish whether the above identified common causes of delay are consistent in construction projects in Dubai, and if so, which have the most severe impact. The survey also aims to explore the construction management's responsibilities and approaches used to minimize the effect of the delay.



Two rounds of questionnaire survey were conducted which were complimented with interviews. In the first round of survey, 52 major construction companies were involved. The initial results obtained from this survey were analysed. Based on the result, questionnaires were distributed to another 10 contracting firms who are working on large projects in Dubai in order to further assess the perceptions of the Client, the Consultant and Contractor of the relative importance of construction delay causes. Questionnaires were sent to technical affair managers, site project managers and construction managers who had good experience and knowledge in the area that can provide an insight into both underlying causes of delay and their relative effect. Samples of responded questionnaire are shown in Table A-1 in Appendix. The response rate was 100%.

14 semi-structured interviews, based on the questionnaire, were also conducted in the two rounds of questionnaire survey. The interviews were helpful in clarifying the ambiguous answers from the questionnaire survey participants. Most importantly, valuable suggestions were obtained about the procedures to overcome the causes of delays which are presented in Chapters 9-11.

#### **6.1.1 Identified Sources and Reasons for Project Delay.**

A review of the theoretical reasons for delay in Chapter 5 covering the responsibilities of each project category/source is shown in Table 6-1.

**Table 6-1: Identified Delay Factors Attributable to the Client, the Consultant and the Contractor.**

<b>Source</b>	<b>No.</b>	<b>Factors, Reasons and Causes of delay</b>
<b>Client / Client Representative</b>	1.1	Regular interference & poor communication
	1.2	Variation order by him & late approval for payment
	1.3	Late supply of information and late decision making
	1.4	Project objectives are not very clear
	1.5	Nomination of Sub-Contractors & Suppliers
	1.6	Many provisional sums & prime cost

	1.7	Duration is not enough for constructing the project – Client request
	1.8	Irregular payments and disturbed cash flow of Main Contractor
	1.9	Routine of Government authorities and approvals
	1.10	Irregular attending of weekly meetings
<b>Consultant</b>	2.1	Incomplete contract documents
	2.2.	Incomplete drawings
	2.3	Week level of design management during design
	2.4	Slow or fast response
	2.5	Drawing & B.O.Q. approved for construction
	2.6	Duration of inspection procedure
	2.7	Experience of Staff in Management & Technical Inspection
	2.8	Delay in submittal and approval
	2.9	Level of communication of Consultant staff
	2.10	Level of quality control
	2.11	Level of response to technical enquiry's
	2.12.	Changes in drawings and specifications
	2.13	Technical site staff on site full time
<b>Contractor</b>	3.1	Organization chart
	3.2	Technical professionalism in the organisation
	3.3	External and internal communications
	3.4	Coordination with sub contractors
	3.5	Centralization with top management
	3.6	Level of mobilization and first site survey
	3.7	Qualification of contractor staff
	3.8	Planning, scheduling and resources
	3.9	Level of quality control
	3.10	Site is very congested
	3.11	Mistakes during construction
	3.12	Similar projects and contractors experience
	3.13	Shortage of materials
	3.14	Quality of Materials
	3.15	Materials Specifications
	3.16	Delay of Delivery
	3.17	Shortage of manpower
	3.18	Skill of manpower

	3.19	Productivity of manpower
	3.20.	Availability of equipments on request
	3.21	Allocation of equipments on site
	3.22	Financing the Project by Contractor
	3.23	Payments of Sub-Contractors
	3.24	Weather conditions
	3.25	Site investigation by Contractor & unforeseen ground conditions
	3.26	Different nationalities of workforce on site
	3.27	Problems with neighbours
	3.28	Preparing the method statement for each work activity
	3.29	Roles of work permits
	3.30	Traffic restrictions

Ten causes of delays were attributed to the Client; thirteen to the Consultant and thirty to the Contractor. These have been formulated as shown in Table 6-2 to list the significance of the major factors of each party on project delay.

### 6.1.2 Results

**Table 6-2: Rankings for Causes of Delay by the Client**

<i>Cause of Delay. (See Table 6-1 For details*)</i>	<i>Respondent Rating</i>	<i>Severity Rating (0 to 5)</i>	<i>Order of Importance</i>	<i>NOTE</i>
1.1	54%	2.70	6	
1.2	59.50%	3.00	5	
1.3	52%	2.95	7	
1.4	51%	2.55	8	
1.5	64%	3.20	3	3 <sup>rd</sup> most important
1.6	67%	3.30	2	2 <sup>nd</sup> most important
1.7	82%	4.1	1	Most important
1.8	63%	3.15	4	
1.9	60%	3.00	5	
1.10	48%	2.4	9	Least important

\*Note: 1.1 refers to the number for the "Regular interference & poor communication" cause of delay listed in Table 6-1.

**Table 6-3: Rankings for Causes of Delay by the Consultant**

<i>Cause of Delay. (See Table 6-1 For details*)</i>	<i>Respondent Rating</i>	<i>Severity Rating (0 to 5)</i>	<i>Order of Importance</i>	<i>NOTE</i>
2.1	67%	3.35	2	
2.2	74%	3.7	1	Joint Highest
2.3	63%	3.15	5	
2.4	64%	3.20	4	
2.5	67%	3.35	2	
2.6	65%	3.25	3	
2.7	41%	2.15	6	Joint Lowest
2.8	74%	3.7	1	Joint Highest
2.9	64%	3.20	4	
2.10	47%	2.25	6	Joint Lowest
2.11	63%	3.15	5	
2.12	67%	3.35	2	
2.13	63%	3.15	5	

\*Note: 2.1 refers to the number for the “Organization chart” cause of delay listed in Table 6-1.

**Table 6-4: Average of Severity Causes of Delay by the Contractor**

<i>Cause of Delay. (See Table 6-1 For details*)</i>	<i>Respondent Rating</i>	<i>Severity Rating (0 to 5)</i>	<i>Order of Importance</i>	<i>NOTE</i>
3.1	79%	3.95	2	
3.2	50%	2.65	14	Lowest
3.3	79%	3.95	2	
3.4	68%	3.30	6	
3.5	66%	3.40	8	
3.6	70%	3.5	4	
3.7	65%	3.15	9	
3.8	63%	3.20	11	
3.9	64%	3.20	10	
3.10	64%	3.20	10	
3.11	76%	3.8	3	
3.12	63%	3.15	11	
3.13	66%	3.30	8	
3.14	65%	3.30	9	
3.15	74%	3.7	4	
3.16	67%	3.35	7	
3.17	67%	3.35	7	
3.18	61%	3.05	11	
3.19	62%	3.10	12	
3.20	64%	3.20	10	
3.21	68%	3.40	6	
3.22	80%	4.0	1	Highest
3.23	72%	3.7	3	
3.24	67%	3.35	7	
3.25	64%	3.20	10	
3.26	60%	3.00	12	
3.27	66%	3.30	8	
3.28	81%	4.05	1	
3.29	69%	2.07	5	
3.30	57%	2.85	13	

\*Note: 3.1 refers to the number for the “Incomplete contract documents” cause of delay listed in Table 6-1.

From the results of the questionnaires and the feedback of those who were interviewed their opinions showed great similarity. They suffer from an unrealistic duration of the project, changes of the design during operational process and the progress of the nominated subcontractors on the site. These are the most common problems causing the delay. In addition to these problems there are many problems still participates to the project delay and has to be considered by the project team.

In the second round of questionnaire the rates and percentage of the respondents of each cause of delay added more values to the causes of delay of each participants as shown in Fig 6-1, 6-2 and 6-3, Appendix (Table A-3) includes the additional data from the second questionnaire responses to give combined figures.

## **6.2 ANALYSIS OF THE MAJOR CATEGORIES OF CAUSES OF DELAYS**

Referring to Table 1-1, which shows the scale of severity, the result of percentage considered as the value of severity by assigning the first highest percentage as the highest value, the second highest as to next highest and so on. Value of 5 is considered as 100% severity, value of 4 is considered as 85%, value of 3 is considered as 65% value of 2 is considered as 45% and value of 1 is considered as 25% of severity.

Referring to Table A-3 in Appendix, in the last column of the table responds enter their experience on the severity of impact of each of the tabulated “identified” delay causes from Table 6.1. This is expressed as a percentage, e.g. a 100% means this factor “always causes delay”: a 0% entry means no overall project delay results from this factor.

For calculation details:

Refer to Table A-3 in Appendix, taking the factor of delay 1.1 which is no. 1 in Client category, the average of the respondent’s severity weight of the factor is of 54%.

The accumulative points of the 52 respondents is 2795 % points out of a max 52x100

\* 52 gave 2795 percentage points (Table A-3) row no. 1

\*  $2795 \div (52 \times 100) = 54\%$  average (Table 6-2) row no. 1

Regarding to ranking,

\*  $100\% = 5$  (as mentioned above)

Ranking =  $\frac{54 \times 5}{100} = 2.70$  (Table 6-2) row no. 1

The average of the severity causes by the Client, the Consultant and the Contractor ranging from 45% to 85% percentage wise. In ranking order the percentage could be considered ranging from 5 to 0, where 5 is highest and 0 is the lowest. The highest ranking is of 4.1 and the lowest is of 3.15 as shown in Table 6-5.

In Table 6-2 the compressed project duration - factor no.1.7 (i.e. the project duration requested by the client) has the highest rank of 4.1 which is a major factor of delays caused by the Client. 81% of responses of client category agreed that the tight schedule is a major problem for Consultants to design and Contractors to build as shown in Figure 6-1.

In Table 6-3, factor no. 2.2 (i.e. the incomplete drawings) and factor no. 2.8 (i.e. the delay in approving the Contractor submittals) have the highest rank of 3.7, which are the major factors of delays caused by the Consultant. 74% of the responses agreed that the incomplete drawings provided by the Consultant and the delay in approving the Contractor's submittals were the major problems. They delay the progress of the work as shown in Figure 6-2.

In Table 6-4, factor no. 2.8 (i.e. lack of experiences in preparing the method statement of each work activity) has the highest rank of 4.05 which is a major factor of delays caused by the Contractor. 74% of the responses of contractor category confirmed that neglecting preparing the method statement of the work activities which is a part of the project construction methodology during preconstruction stage created many problems to the Contractor during construction shown in Figure 6-3.

Table 6-5 shows the measure of the relative severity of delays in terms of their impact upon the project. The following discussion will concentrate on the most important causes of delay by the three parties sequenced as per the survey as tabled and formalized in Table 6-5.

**Table 6-5: The Major Causes of Delay as per Survey Results Analysis**

Category		Major Causes of Delay	Ranking	Severity Weight %
<b>Client</b>	1.	Duration is not enough for Construction the Project – Client request (squeezed time)	4.1	82
	2.	Provisional sums and prime cost	3.35	67
	3.	Many nomination of Sub-Contractors & Suppliers	3.25	65
	4.	Regular monthly payment by Client to Main Contractor (delay of payment)	3.15	63
<b>Consultant</b>	1.	Incomplete drawings	3.7	74
	1a	Delay in approvals of submittals	3.7	74
	2.	Incomplete contract documents	3.35	67
	2a	Change in drawings and specification	3.35	67
	3.	Duration of inspection procedure	3.25	65
	4.	Level of staff communication – Staff Consultant	3.20	64
	5.	Design management not done properly during design stage (poor level)	3.15	63
	5a	Level of response to tech. inquiries	3.15	63
	5b	Attendance of Consultant Site Staff on site as a full time	3.15	63
<b>Contractor</b>	1.	Preparing the method statement for each work activity	4.05	81



	2.	Financing the project by the Contractor	4.0	80
	3.	Organization Chart	3.95	79
	3a	Communication Externally & Internally	3.95	79
	3b	Mistakes during Construction	3.8	76
	3c	Materials specifications	3.7	74
	3d	Payments of Sub-Contractors	3.6	72
	4	Level of Mobilization & First Survey	3.5	70
	4a	Allocation of equipment's on site	3.40	68
	5	Delay of delivery	3.35	67
	5a	Shortage of manpower	3.35	67
	6	Centralization with top management	3.30	66
	6a	Shortage of materials	3.30	66
	6b	Neighbours problems	3.30	66
	7	Qualification of Contractor's Staff	3.25	68
	8	Confined Site	3.20	64
	8a	Level of Quality Control	3.20	64
	8b	Availability of equipment on request	3.20	64
	8c	Site investigation by Main Contractor	3.20	64
	9	Planning, Scheduling & resource	3.15	63
	9a	Similar Projects and Contractor Experience	3.15	63

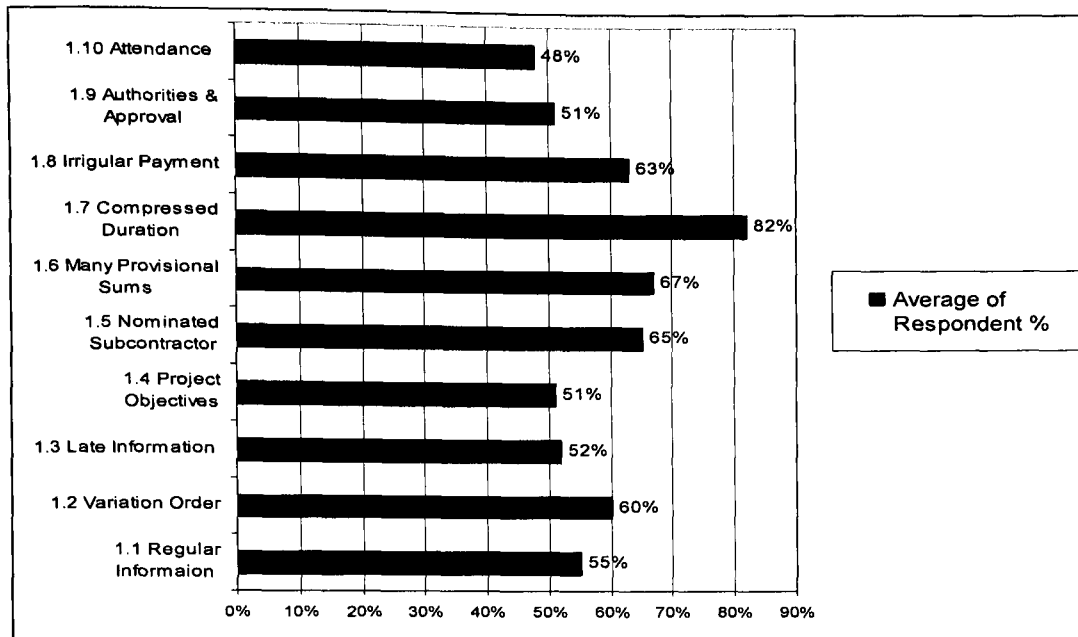


Fig 6-1 Common Factors of Delay Caused by the Client with the Serial Number as per Table 6-2

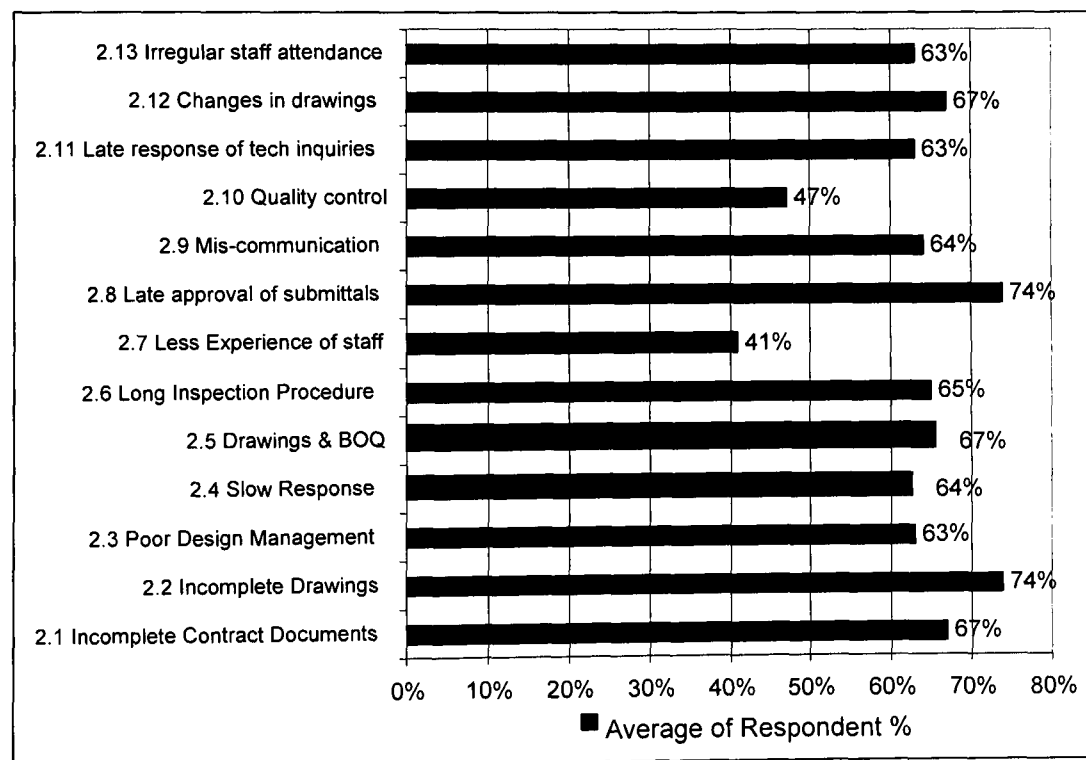
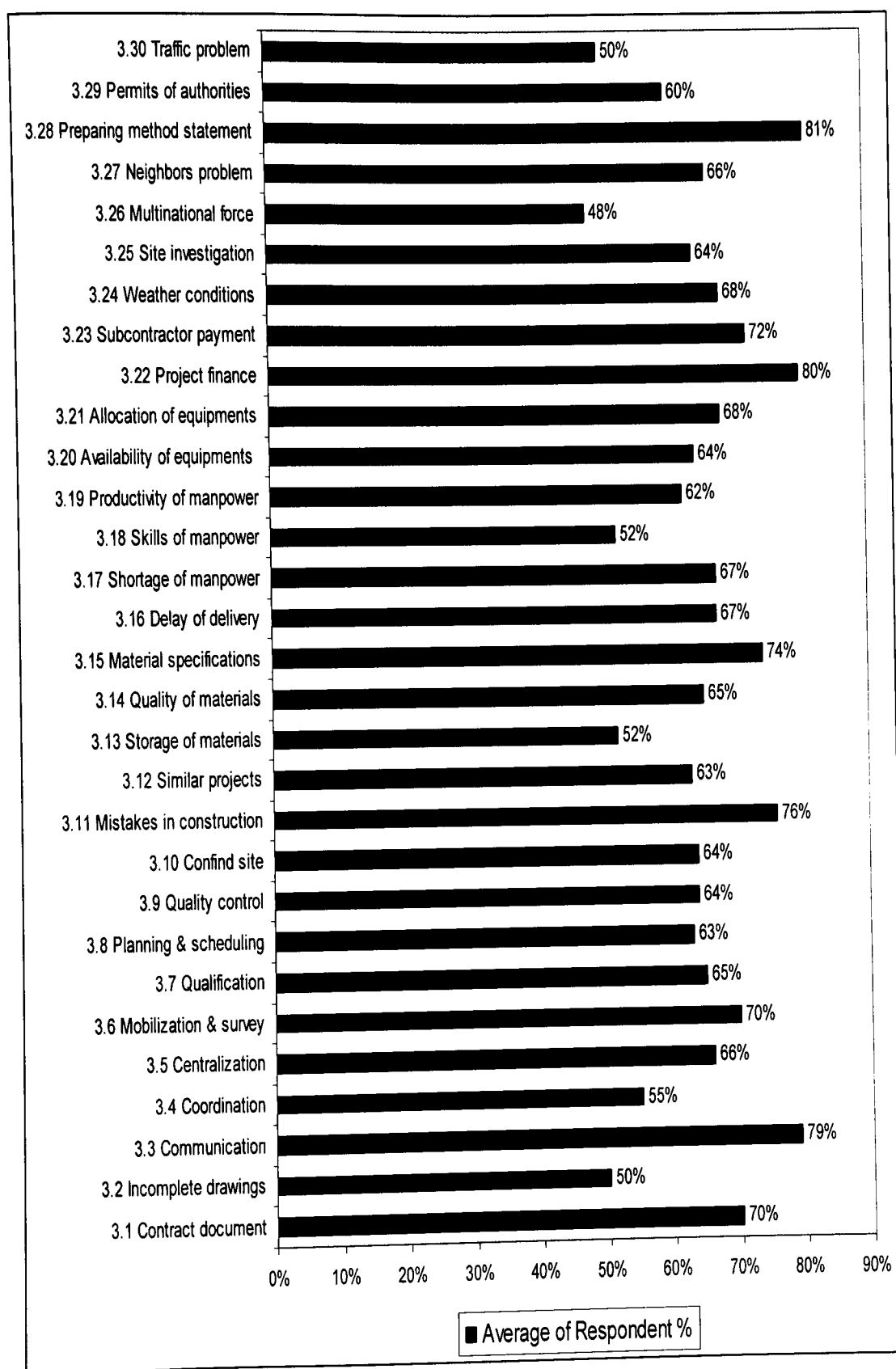


Fig 6-2 Common Factors of Delay Caused by the Consultant with the Serial Number as per Table 6-3



**Fig. 6-3 Common Factors of Delay Caused by the Contractor with the Serial Number as per Table 6-4**

## **6.3 DISCUSSION**

The respondents, who were asked to express their opinion about the causes of project delay, have reported the followings:

- The Client's contribution to causes of delay is of 11.76% (4 out of 34 major causes)
- The Consultant's contribution to causes of delay is of 26.47% (9 out of 34 major causes)
- The Contractor's contribution to causes of delay is of 61.76% (21 out of 34 major causes)

This result indicates that there is a high consistency between the survey results (shown in Figures 6-1, 6-2, 6-3) and the prime causes identified from literature reviews. A number of factors that adversely influence and affect the construction projects were identified and discussed in the previous chapters, most notably “contractually and technically” from the Contractor and the Consultant sides, and “financially” from the Client side.

In the traditional procurement approach, the Client and the Consultant are involved in developing the concept and design of the project, while the Contractor is involved in tender, pre-construction and construction which makes the Contractor's Project Manager in a very difficult position to handle any missing issue which may cause problems to the project progress. In Table 6-5, it is observed in the Client category that ranking of project duration is high, meaning that they are more likely to impact on the project progress than the Consultant and the Contractor categories, where a wider range of major causes of delay occur. Where the identified major cause of delay is severe it is more likely to affect the project progress. The pivot analysis of the results verifies the correspondence between theoretical and practical experiences of delay.

The following is a brief discussion of matching the relative importance of the group and causes of delay factors in Table 6-5 in the Client, the Consultant and the Contractor subgroups.

**A) Key Causes from the Client**

The causes of delay by the Client were found to be important, and affect both the Consultant and the Contractor and it reflects their impacts upon project progress. These causes limit the effective execution of design management.

**A-1 Unrealistic Control Duration:** Clients are looking for a rapid return on their investment. In UAE it is not unusual for a Client to stipulate to the Consultant a fixed duration which may be in conflict with the Consultant's proper design lifecycle. This means designs are more likely to suffer from insufficient appraisal which leads to variations being issued during construction.

**A-2 Many Provisional Sums and Prime Cost:** Clients always like to leave some items in the bill of quantities un-quantified, this prevents the Contractor preparing a method statement for these items on time and once the details of this bill are given (at very late stage), the work programme will be disturbed and the main Contractor will find difficulties in achieving the target of the project.

**A-3 Nomination of Sub-Contractors and Suppliers:** Most Clients prefer their own Sub-Contractor for specific specialized work. They often instruct the Contractors directly through the Consultant to enter the sub-contract agreement based on limited conditions that may not suit the main Contractor such as an advanced payment, duration, penalties, submittals and approvals. If the main Contractor rejects the unrealised terms, conflicts occur and delay will progress until a final agreement is signed between the involved parties. This can cause major delays in project duration.

**A-4 Client's irregular payment to the main Contractor:** Failure of the Client's paying in full the monthly due amount (Certified valuation) to the work completed disturbs the Contractor's cash flow and the project income. This in turn affects the payments to Sub-Contractors, who are obligated to purchase material from suppliers. Project execution will be consequently affected financially. This will be reflected in

the work progress and it can cause major delay to the project because if there is no regular payment the work program will be affected.

**B) Key Causes from the Consultant**

The Consultant offices in Dubai are reluctant to refuse potential commission and follow a policy of *"Yes we are always ready to design your project"*. The design offices are frequently overloaded because construction is booming in the city. Most of the Consultant design offices do not have sufficient design and supervision staff to achieve the project objectives, which affects the quality of the work and consequently reflected on the Contractor performance.

**B-1 Incomplete Drawings:** If the Client requests an unrealistic duration for design and execution of his project large margins of errors will likely result in the drawings and specifications. Also improper coordination between structural and architectural and other service drawings will arise resulting in incomplete drawings, which is considered as a delay factor from the Consultant side.

**B-2 Delay in approval of submittals:** The delay in the process of approving the approval and submittal of materials either by suppliers or the nominated Sub-Contractor is affecting the project progress. Since it is long procedures the Consultant are reluctant accept any nominated Sub-Contractors or supplier by the Client at very late stage to avoid causing any delay of the proposed work item. This however often does occur in projects.

**B-3 Incomplete Contract Documents:** The Consultant has the full authority to issue changes or correct the mistakes in the drawings and correcting the discrepancies in the contract document on behalf of the Client, the Consultant staff are always not sure of correcting or issuing this kind of instruction until they refer to their Manager (centralization policy) to avoid any contractual problem with Client. This keep the Contractor suffers of getting the new instruction resulted from correction of discrepancies.

**B-4 Changes in Drawings & Specifications:** Some Engineers from the Consultant's side are not involved in the original design and they do not have enough experience in design practices. Sometimes they change the drawings and

specifications when any technical inquiry is raised by the Contractor; this takes longer time to approve because it is not allowed to change any drawing without referring to the Municipality approval for auditing which takes the Contractor a longer time to execute the work. It occurs due to the lack of coordination of Consultant Staff.

**B-5 Duration of Inspection Procedure:** Inspection procedure is very important and it is must. The Consultant has to make sure that the work is implemented as per standards of quality. Sometimes Consultant inspectors do not have enough experience of inspection process of work item. Inspection process should be implemented by the Engineer followed by Authorities where there is a short of inspectors. Accordingly the Contractor has t wait the approval from Authorities to pour concrete. The inspector needs professional experience of inspection and must consider the time factor of Contractor to avoid the delay.

**B-6 Level of Consultant Staff Communication:** When a technical problem was identified by the Contractor, the Resident Engineer was not able to give any response without referring to the Consultant Service Engineer (who was not available on site). Meantime the Resident Engineer does not have the power to force him to attend because financially nobody is entitled to pay his overtime. The Contractor has to wait until the Service Engineer comes. This causes a delay to the Contractor in proceeding for any work item due to the lack of communication factor of Consultant staff.

**B-7 Poor Design Management:** Many errors and mistakes during construction appear as a result of the poor design management. Once changes are start by the Client during irregular site visit, it indicates that the project objectives were not clear to the Consultants during preparing the feasibility study with Clients. Many Consultants are not aware of the management of the design. It is a major factor from Consultant sides which affects the project progress negatively.

**B-8 Level of Response to Technical Enquiry:** This depends of the experience and personality of the Resident Engineer to respond immediately. The less experience (Management and contractual experience) they have, less they are likely to be able to give as immediate answer without referring to design team. This can delay the Contractor on the progress of his work as programmed.

**B-9 Full time attendance of Consultant Staff:** The Consultant Resident Engineer is not always available on the site due to the lack of the staff. The Consultant Offices are overloaded and Engineers are distributed to more than two sites, so they have to visit all sites daily and check, monitor, observe the work progress for each of them. The Resident Engineer on the site becomes not able to follow-up the project which will affect the Contractor work performance and quality. During the final inspection the Contractor will be instructed to rectify or redo the work again.

**C) Key Causes from the Contractor**

As shown in Table 6-5, the largest number of, major, causes of project delay are attributed to the Contractors. **Odeh A. (2002)** has confirmed that “*Contractor is more concerned with Managerial and operational factors such as site management and construction method*”.

Although the Contractor traditionally was blamed for project delays, he has valid complaints about the system. If the top management gives full authority to qualified experience engineers to manage the project, it will become possible to overcome or reduce all the problems which are causing major delay as indicated in Table 6-5 under the “Contractor” heading.

**C-1 Preparing the Method Statements:** Most of the Contractor’s Project Managers do not prepare the method statement for the work activities which require special technical input. This is not because they do not have the experience but because they do not have enough time to prepare the study. In some projects the Contractor’s Project Manager must also work as a quantity surveyor or a site engineer to compensate the shortage of the resources. This is reflected negatively on the project.

**C-2 Financing the Project by the Contractor:** Most Contractors do not use the advance payment which they receive from the Client once the contract is signed because they may use the money for another project. This causes delays in work progress and shortage of materials. Therefore the main Contractor must have another source to finance the project without affecting the material supply, Sub-Contractors, salaries, etc., or delay results.



**C-3 Organizational Chart:** It is doubtful whether Contractors have much time in thinking about site organization of some projects. According to **Ogunlana S. (1996)** *"They always prepare the organization chart for Consultant approval and for Client satisfaction as many of the positions shown were not filled and some indicated functions were totally omitted on sites. But the Major problem is the lack of experienced technical staff"*. Some Contractors personnel therefore lacked the experience to foresee problems before they arise and hence avoid any consequential delays.

**C-4 Communication Externally & Internally:** The experience of Contractor's Project Manager is necessary to communicate with the Client, Consultant and Sub-Contractor's to solve the technical and the financial problems. He should also be able to communicate with the site staff and top management to get the best production, create a good atmosphere and make the site staff fully aware of project objectives. Due to the mixed work force in the contracting sector in Dubai, it is normal to hear more than five different languages in one project which makes it difficult for the Contractor's Project Manager to effectively communicate. Problems arise during translation or during a regular meeting between the three involved parties. This causes a major delay for the project progress. Especially if the Clients are not Arabs or do not speak the Arabic Language.

**C-5 Mistakes during Construction:** These arise due to the limited experience of manpower and supervisors and poor communication between Engineers, foreman and gangers. In addition the shortage of skilled people on site and a fast track projects are the major reasons for mistakes during construction. It is necessary to have a well experienced, educated general foreman able to communicate with the manpower to avoid any delays. He must also be able to communicate with Engineers, Contractor's Project Manager and Consultant to avoid any delay.

**C-6 Materials Specifications:** Material purchases for most of the sites are arranged by the head office. Materials specifications are often not clear because purchasing department employees do not understand the technical relevance of the purchased materials. They cannot explain to suppliers the technical specifications which in turn delays issuing the purchase order. The Contractor's Project Manager

does not have Authority to purchase or negotiate with suppliers any alternative materials to the specified material.

**C-7 Payment of Sub-Contractors:** This is very common problem to all Contractors. Contractor's Project Manager issues regularly monthly payment for Sub-Contractors from the site office to the head office specifically to the financial manager who normally holds it for two or three weeks. The Sub-Contractor may due to cash shortage not be able continue the work or he may stop the work. Therefore a very poor system for payments of Sub-Contractors must be arranged and organized properly to avoid working progress delay.

**C-8 Level of Mobilization and First Survey:** It is a most common mistake for the Contractor's Project Manager fails to undertake a proper site investigation during mobilization. This can result in failure to locate the existing services, fixing the offices in wrong places and not maintaining any access for materials storage. The duty of Contractor's Project Manager is to supervise all of these operations to avoid any delay at later stage. This is time consuming, increase project costs and may contribute to delay. Support of a qualified Site Engineer can help this function.

**C-9 Allocation of equipment on side:** This factor is directly related to experience of the Contractor's Project Manager and his action during mobilization stage (as stated in C-8). Most Engineers have a problem of allocating site equipment which delays the work activities. This happens because the construction methodology is not prepared during pre-construction, refer C-1.

**C-10 Delay of Delivery:** Delivery of materials is a problem for Contractor's Project Manager, as work activities in the project will be dependant on material delivery. Suppliers prefer to send the materials to Contractors who do not have any payment problems or sometimes they refuse to send the materials directly to site until a full payment for another of the Contractors projects are paid. A proper coordination is required between Purchasing Department, Contractor's Project Manager and supplier to deliver materials on time for the project to avoid any resultant delay.

**C-11 Shortage of Manpower:** Due to the increase in demand for construction project, there is a shortage of manpower, skilled and unskilled labours. The Contractor's Project Manager faces this problem whenever he is requesting

manpower. The usual response from the management is *"do your best to finish this activity with the manpower that you have till we get you some people from other sites"* This is a problem as the Contractor's Project Manager has to power to appoint any labour or workers without the top management approval. If they do not agree to appoint any body, for cost saving, it will be reflected in the work progress and quality of work.

**Proverbs D. and Holt G. (2000)** stated that *"The proposed number of supervisors including all levels of site management, excluding persons, such as charge hands and gangers are required to undertake the manual work"*. It is strictly recommended that the Contractor's Project Manager should insist to bring the proposed number of the required manpower to achieve the work progress.

**C-12 Centralization with Top Management:** Most Contracting companies in Dubai, do not give full authority to Contractor's Project Managers, even for technical matters on site (but not always). For any action he has to refer to top management to get approval and top management may give a wrong decision, since they are not familiar with the details of the problem itself. It is necessary to allow the Contractor's Project Manager to take his own decision on the site on factors directly affecting work in progress such as appointing labourers, Sub-Contractors, materials order ....etc.

**C-13 Shortage of Materials:** The import restrictions on construction materials are believed to be a major cause of shortage. The Quality of imported materials must meet the local demand, which they some times fail, specifications of the required materials to be used in the project mean they are not always available on the local market which creates financial problems for the Contractor (for ordering, purchasing through Bank) and suffer delays in receiving this materials. This will be reflected on the project progress.

**C-14 Neighbour Problems:** Disputes with site neighbours is a major factor causing work stoppages. This often creates a severe restriction of working space for equipment such as tower cranes and sometimes imposes restrictions on working times. This forces the Contractor's Project Manager to reschedule the working hours for both the Sub-Contractor and his own manpower to suite the regulations, and to avoid future problems with neighbours.

**C-15 Qualification of Contractor Staff:** Most Contractor's Project Managers suffering from the problems of unqualified employees in their projects. These employees are not able to take decisions because they do not have enough experience and qualification. Often they were appointed on the basis of the recommendation of the Consultants or top management. This does not create a good atmosphere between them and the Contractor's Project Manager, which causes a major problem on work in progress and may create a mistrust relation.

**C-16 Confined Sites:** Confined sites always produce difficulties for staff, difficulties for parking the trucks for loading and off loading materials, finding a space for tower crane location and making a good store for the materials. It is always recommended to study the situation of the confined site separately during pre-construction stage to enable the Contractor's Project Manager plan to accommodate the project resources to avoid any disturbance resulting in delay.

**C-17 Level of Quality Control:** Since the skilled and unskilled labours in the project are not very qualified persons, this affects the quality of work. There are many reasons behind quality failure in projects, such as improper supervision, less knowledge in technical specification, a bad communication between the site staff and work force often (because of the language factors). To overcome these problems the Contractor's Project Manager has to make sure that the staffs on site takes regular training courses in quality and how to finish or handover the final product as per quality standards.

**C-18 Site Investigation by the Main Contractor:** Contractor's Project Managers have problems with finding unforeseen and unexpected things during excavations or of existing services not mentioned in the Contract or BOQ. This causes a lot of additional time and money to be spent to resolve these difficulties. It happens because improper site investigation is done during tender stage. It is always recommended that the tender department investigate the site properly and they have to consider all obstructions which may delay the work progress. These findings have to be recorded officially to avoid any delay or claim.

**C-19 Planning, Scheduling & Resources:** Most project Contractors use the bar chart for planning and monitoring but there is a clear lack of detail. Insufficient experience of Planning Engineers means they do not prepare or monitor the plans.

There is an attitude which assumes that because of the changes made by Consultant and Client there is no need to updating the schedules and detailed plans. This is completely unacceptable and is affecting the project progress by losing opportunities for improved efficiency.

**C-20 Similar Projects and Contractors' Experience:** Since each project in Dubai is unique, there is often a rivalry between Clients and Consultants as to whose projects are the most complex and prestigious. This requires the Contractor to bring special resources and techniques to construct these more ambitious projects. Fabricating a new special form of work is necessary to complete the job. This needs special resources which will come from outside the UAE and they cost the Client much more than the local resources which affect the cash flow of the project.

In addition to the above factor caused by the Contractors, some other factors such as equipment usage, resource estimates, project buildability and human resource shortages identified by **Kaming P. (1997)** in the Indonesia construction industry were also observed in Dubai.

## **6.4 SUMMARY**

This chapter summarised the process of the initial survey conducted in this research to explore the primary causes of delays from the project participants. 62 major contractors in Dubai participated in the questionnaire and interview. Both quantitative and qualitative approaches have been adopted to analyse the results. It shows a significant agreement between theoretical predictions of delay obtained from the previous literature review and those experienced in construction projects in Dubai. For example, the top reasons for delay caused by each major participant in Dubai construction projects are:

- The Client:
  - 1) Inadequate project duration
  - 2) Too many provisional sums and prime cost

- 3) Many nomination of Sub-Contractors & Suppliers
  - 4) Irregular monthly payment to the Contractor
- The Consultant:
    - 1) Incomplete drawings  
Delay in approvals of submittals
    - 2) Incomplete contract documents  
Changes in drawings and specification
    - 3) Duration of inspection procedure
    - 4) Poor communication of the Consultant's site staff
    - 5) Poor design management  
Low level of response to the Contractor's technical inquiries  
Low attendance of Consultant Site Staff on site
  - The Contractor:
    - 1) Preparing the method statement for each work activity
    - 2) Financing the project by the Contractor
    - 3) Organization Chart  
Communication Externally & Internally  
Mistakes during Construction  
Materials specifications  
Payments of Sub-Contractors
    - 4) Level of Mobilization & First Survey  
Allocation of equipment's on site
    - 5) Delay of delivery  
Shortage of manpower
    - 6) Centralization with top management  
Shortage of materials  
Neighbours problems
    - 7) Qualification of Contractor's Staff
    - 8) Confined Site  
Level of Quality Control  
Availability of equipment on request

Site investigation by Main Contractor

9) Planning, Scheduling & resource

Similar Projects and Contractor Experience

# **CHAPTER 7**

## **CASE STUDIES I AND II**



## **7.0 INTRODUCTION**

This chapter presents the two case studies conducted in this research and addresses the reasons of undertaking these case studies with the problems and conclusions which could be used as a guideline to mitigate the project delays. Full analysis is made to the case studies by demonstrating all events and problems and the reasons behind the actual causes of delays contributed by all the project participants.

Both cases I and II adopted traditional procurement approaches. The occurrence of causes and types of problems and delay has been explored in full details from different perspectives (i.e. the Client, the Consultant and the Contractor). Causes of delay are divided based on contractual, technical, legal, and financial where contractual responsibility was assigned to determine the proper action which should be taken to mitigate the causes of delay. The results of delay will be analysed and compared with the findings from Chapter-6. This chapter will be divided into two sections and each section will contain the full case study details, analysis and summary.

This will provide a specific practical confirmation of many of the causes of project delay that have previously been confirmed by literature review and questionnaire. Through the examination of the practical manifestation of such problems, it provides the professional an insight that will lead to the development of recommendation for the project manager operating in UAE to reduce the occurrence and effects of project delays.

## **7.A.1 BRIEF DESCRIPTION OF THE PROJECT**

### **CASE STUDY – I : PROJECT ‘A’ ESTABLISHING REGIONAL HEAD QUARTER OF BANK MELLI IRAN IN DUBAI**

#### **7.A.1.1 CONTRACT DETAILS and CONSTRUCTION**

Project title	: 3B +G+M+10 Storey Regional Head Quarter Building of BANK MELLI IRAN
Locations	: Baniyas road, Deira, Dubai, UAE
The client	: Bank Melli Iran P. O. Box 1894, Dubai, U.A.E.
Consultant	: W. S. Atkins and Partner Overseas P. O. Box 5620, Dubai, U.A.E.
Contractor	: Saudi Binladin Contracting Group P.O. Box 1555, Dubai, U.A.E.
Award of contract letter	: 11-03-01
Engineers order to commence	: 02-06-01
Duration of construction including	: 400 days Mobilization
Contractual completion date	: 06-07-02
Original contract value	: Dhs. 27,000,000
Revised contract value	: Dhs. 24,830,000
Revised completion date	: 30-09-02
Approved official handing over date	: 30-09-02
Defect liability period valid till	: 30-09-02
Number of nominated Sub-Contractors	: Eight numbers
Number of domestic Sub-Contractors	: Sixteen numbers
Extension of time granted	: 90 days
Overhead against cost of extension granted	: Dhs. 150000 : 84 Days
Type of tender and contract applied	: Traditional procurement approach
Contract conditions applied	: FIDIC Conditions and terms of Contract

### **7.A.1.2 PROJECT BACKGROUND**

Bank Melli Iran wished to establish a regional Head Quarters for their Middle East operations and selected Dubai as their considered choice. A building existed at their plot measuring 6,577sq.ft. on Beniyas Road (Deira, Dubai), which has remained a banking hub in Dubai for several decades. With foresight and vision, the Bank decided to remove the old building structure and construct a new building to offer up-to-date customer banking prompt banking services with the most modern facilities. It remained a daunting task to achieve Regional Head Quarter requirements of the Bank within the plot size restrictions. The local regulations applicable to this location did not permit more than a 10 Storey height structure and a provision of parking space also was a mandatory.

The Bank selected a very competent Consultant M/s W.S. Atkins and Partners Overseas to accomplish the Design. The Consultant strived to work out details for this unique new building and to meet the bank precise requirements in conformity with the local regulations.

The site of Construction is located on plot 115-140 on Baniyas Road at Deira, Dubai with a plot area of 6577sq.ft. The building elevation is facing the creek side with an available building plan area of 6,222 sq. ft., the requirements of space for car parking and MEP equipment was met with provision of Three Basements with Ground Floor + Mezzanine Floor and ten upper stories. The Consultant succeeded in providing an overall built-up area of 86,800 sq. ft on this moderate size plot of land.

The detailed planning required to meet the bank's requirements along with the restrictions imposed on its execution, necessitated the selection of long standing experienced contractor to implement various associated activities in a professional manner and to monitor the overall works in close coordination with the Consultants, The client and Local Authorities. Regular coordination was maintained to study and analyse the associated problems of the project such as traffic flow around the site and the confined space to achieve the proper planning required. Saudi Binladin Contracting

Group was selected as the Contractor for this prestigious project given its great construction expertise and reputation.

## **7.A.2 BRIEF DESCRIPTION OF THE PROJECT SPECIFICATIONS**

The building structure consists of 3 basements, ground floor, mezzanine and 10 upper floors with a total built-up area of 8,100 sq. m. with forced ventilation for the basement and central air-conditioning for the rest of the floor. A lift with a 6 passenger capacity links the car parking areas to the ground floor. All electro-mechanical, fire protection, air-conditioning and security system facilities were provided to the, than current standards.

All basement floors are fully utilized to accommodate 47 cars along with housing the MEP equipment, electrical room and water feature room. The vault rooms, reception, telephone, services control panels, ATM Rooms and Main Entrances for the Bank are on the ground floor. The customer reception, counters and catering facilities are on the mezzanine floor. Office, management, catering facilities and telephone room are on 1<sup>st</sup> and 2<sup>nd</sup> floor. The 3<sup>rd</sup> floor was designed specifically for IT Works and computer operations while the 4<sup>th</sup> and 5<sup>th</sup> Floor was designed for top Management and executive managers. The 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> floors remained areas for offices for leasing to selected bank clients. The 9<sup>th</sup> floor was dedicated to two luxury furnished flats for the executive Managers. Where the 10<sup>th</sup> floor and roof contains of pent house and the main meeting room, chiller rooms, pump room, electric standby generator room and transformers room were located in the roof, Figure. 7A-1 shows the cross section for the building from bottom of 3<sup>rd</sup> basement to top of building.

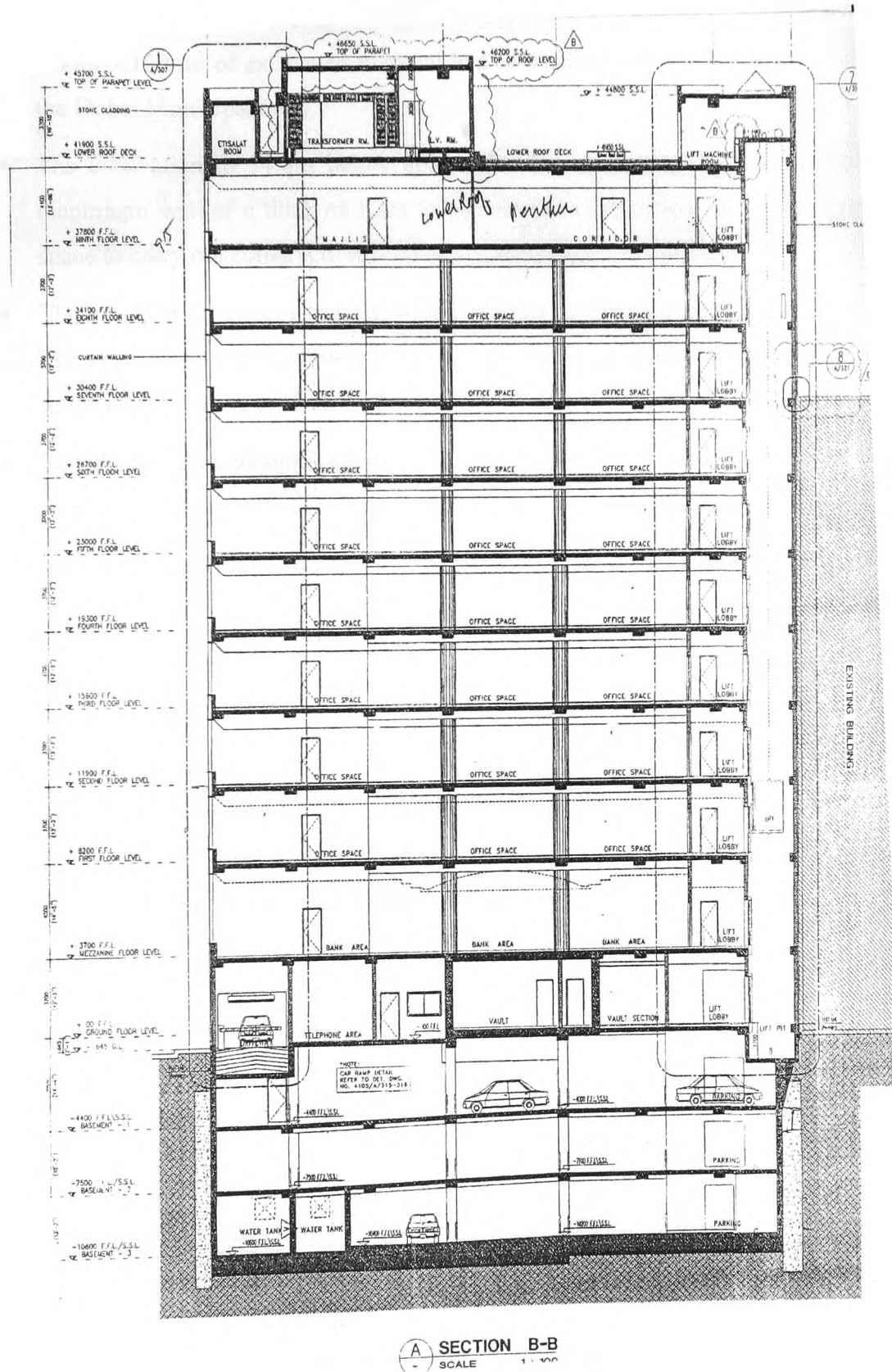
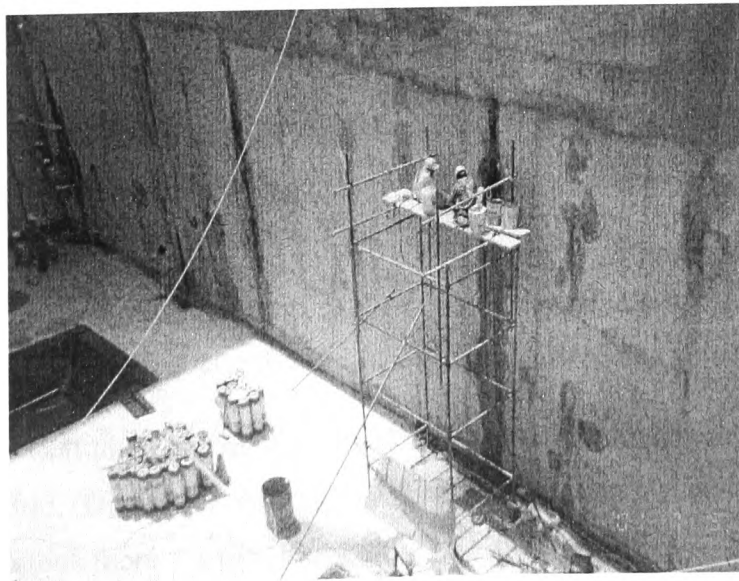


Figure 7.A-1: "Cross Section for the Building"

#### 7.A.2.1 Sub-Structure Works

- About 9,150 m<sup>3</sup> of excavated material had to be disposed of to a tip designated by the Dubai Municipality.
- The excavation to 14.0m below ground level was accomplished by providing a diaphragm wall of a thick of 1.2m to contain the surrounding earth and to provide space to carry out construction.
- The de-watering system was employed in order to carry out the excavation works. The system of dewatering was arranged to serve the work from the excavation stage to the casting of the 5<sup>th</sup> floor slab.
- The depth of excavation was 14 meters from natural ground level where heavy machinery was deployed, to excavate and dispose of the sand material to tip.
- The shoring was done by a nominated Sub-Contractor who constructed a diaphragm wall, which was supported by anchor cables at three levels and at every two meter along the wall length.
- Plaster has to be provided to the diaphragm wall in order to apply waterproofing. Cleaning and plastering was done by the Main Contractor as shown on Figure 7A-2
- The Substructure comprised of the raft foundation-forming the base of basement 3 along with 45 cm reinforced concrete wall abutting the diaphragm wall. Columns, ramps and walls have been provided to the design and layouts.



**Figure 7.A-2: Plastering of Diaphragm Wall**

### **7.A.2.2 Super Structure Works**

- Besides the reinforced beams, slabs and columns, the superstructure provide for the banks specific requirements, of vault room with 40cm thick walls, floors and ceiling slab designed against all explosions noting that special steel reinforcement (tang bars) was used. Trade mark of CHUBB, U.K. made was specified.
- The building's external surface is a faced concrete wall. The purpose of this kind of design is to suit the external wall cladding of heavy granite panels (4cm thick) and to benefit by a reduced spacing of each floor by providing the shear walls in the four corners of the building as shown on Figure 7A-3.
- The reinforced concrete wall along with the large size vertical opening is designed to take the load of a unique wavy spider glass, designed and fixed for the first time in the region.



**Figure 7.A-3: Spider Wavy glass openings and the four Shear Walls Corner**

- The front elevation wall has a special feature of circular opening 14 meters diameter in the concrete wall to fix the unique “Laminated” glass manufactured only in one place in the world, (U.S.A.). Preparing the shutter and casting that opening through different stages took more than 35 days.

- The roof slab is designed to take all electro-mechanical machine services including transformer and generators. The slab was provided with a floating slab system to absorb machine vibration and sound.

#### 7.A.2.3 Elevation of the Building and Special Features

- The four elevations of the building have been aesthetically treated with Spanish granite cladding thickness of 4mm flamed and polished providing a long term maintenance free surface.
- The front elevation has a 12-meter diameter circular opening running across four floors height (Ground, Mezzanine, 1<sup>st</sup> and 2<sup>nd</sup> floor). A special lamart glass is fixed to the big opening to provide a unique decorative feature to the outside elevation.
- The front elevation bears a special aesthetic feature is called the “spider wavy glass”. Its wavy characteristic wavy glass runs from the ground floor to the ninth floor with a width of 2.2m. The design and installation of this type of work required special engineering skills.

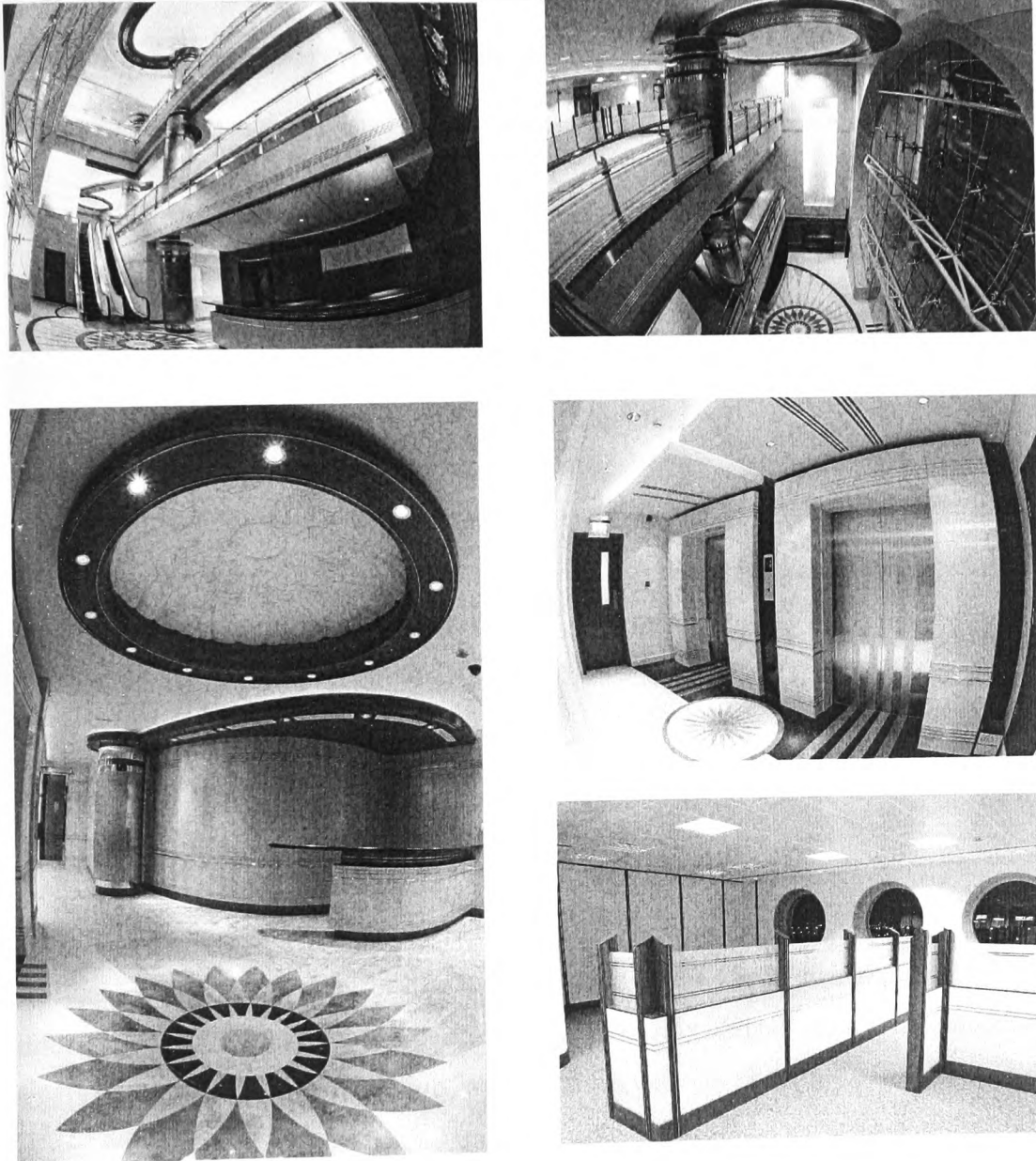
#### 7.A.2.4 Fit-out and Interior Design Works

The fit out works contained the following items:

1. Marble and Granite flooring	10. Decorative wooden floors
2. Marble and Granite (internal wall cladding)	11. Stainless steel handrails
3. Wooden Partitioning	12. Stainless steel strips
4. Columns steel cladding	13. Round bulk wooden ceiling
5. Wooden counters for customers.	14. Wooden floors and arcade
6. Marble counters.	15. Supply and fix of Carpet
7. Natural Stone Cladding	16. Vinyl flooring
8. Decorative gypsum ceiling works	17. Raised flooring for 6 <sup>th</sup> , 7 <sup>th</sup> and 8 <sup>th</sup> floor only
9. 60 cm x 60 cm Aluminium false ceiling	18. Wooden panels.



The above mentioned materials and their suppliers were 'nominated' in the contract by the Client and the Consultant. Sampling process of materials and workmanship on site must be checked and approved before proceeding to the work. Figure 7A-4 shows some of these materials.



**Figure 7A-4: Fit-out and Interior Design Works**

### 7.A.2.5 Electro-Mechanical Works (MEP)

The scope of this work activity was assigned to one Sub-Contractor through The client (Nominated Sub-Contractor) for supplying, fixing and commissioning all electro-mechanical works, which cost almost one third of total project value.

1. Electrical Works	2. Mechanical Works	3. Pumping Works
- Light fittings (imported)	- A/C Chillers	- Water pumps on roof
- Electrical wiring and panels	- Ducting works	- Drainage and waste water system
- Switches and socket.	- Thermostat	- Water pumps in water tank
- Fire Alarm System	- Grill and diffusers	- Heater pumps and plant room pump
-Safety and Camera system	- Extracting fans	- Water feature pumps
		- Sanitary ware connections, fittings and fixing
		- Kitchen connections and boilers

### 7.A.3 INTRODUCTION TO CAUSES OF DELAYS

The case was conducted according to the history of the events and the availability of information. Each of the project participants fulfilled his obligations and responsibilities solely in a way to complete the job, without much concept about the potential problems of project delay and reasons behind it.

Many causes of delays have been witnessed and well-documented since the beginning of the project which becomes a very useful data for comparison with the primary causes of delays and the major factors of delays identified in Chapters 5 and 6. The actual events, data, records, facts, claims and causes happened to all participants in the case study are very valuable input to the analysis.

The project manager was informed by senior management to meet the technical manager and tender and contracts manager to give construction overview of the project, being the person designated by them to manage this project, once the main Contractor received the commencement letter from the Consultant. All the contractual documents including the Bill of Quantities, Specifications and Drawings (Structural and Architectural only) were issued to the project manager.

Site mobilization was to start immediately and it was also required to prepare and submit a full report of site requirements, method of execution, programme of works and the general plan within two weeks. An immediate site visit was planned to check the site conditions and to prepare a plan for mobilization but the first impressions indicated potential problems may occur in excavation. This had already been started by a nominated Sub-Contractor without any coordination with the Main Contractor. There was no space to initiate mobilization due to the storage of temporary excavated material on site prior to its removal. The general impression was that the project handing over time was unrealistic mainly because of its location. The project was finally executed as per the standards of quality specified and handed over, but not on time. An extension of three months was granted to the Main Contractor with the associated costs due to the delays incurred. There were several reasons resulting in the delay and including factors arising from several parties involved during project execution, which contributed to the overall delay.

#### **7.A.3.1 Delays caused by the Client**

##### **A. Contractual Reasons**

Failure of the Client to assign the whole project to a project management firm which would provide him with the highest quality service with respect to contractual documents, has caused some contractual problems between the Client and other participants (e.g. the Consultant and the contractor). The reason behind these problems are the delay of the Client to delivering the site to the main contractor, the delay in approving the change order, and the delay in resolving the final settlement of contractor claim.

Accordingly to **Karl S (1995)** *“Client failure of recruiting the necessary personnel for checking all contract documents before signing the contract and during project”*.

Some other reasons behind the contractual problems are the lack of the technical terms and conditions in the contract document. Nomination of subcontractors for the MEP works, Fit-out works and external cladding which requires significant of site presence were also other reasons behind these problems along with suspension of some work activities verbally during the Client site visits.

### **B. Technical Reasons**

Other technical issues caused many problems reflected negatively on the project where these problems mainly caused by the Client. Process of Engineering Design and process of Building Design was not explained properly to the client's and many multiple changes made during each site visit by the client's Management where communications became poor with construction parties during visits. Other problems are misunderstanding the critical dependence of the unique front elevation of the building on the required time for handing over the project and the technically incorrect analysis, by the Client, of the Method of Statement of the work activities submitted by the Main Contractor.

### **C. Legal Reasons**

Failure of Client to co-ordinate with government authorities during planning for permits and issuance to N.O.C.'s (No objection certificates) and failure in coordination between nominated Sub-Contractor in issuing the necessary permits from authorities for specific works, which has to be executed by them and failure of owner to get the services supplied to the building for commissioning the works by the public authorities were some of the legal reasons caused by the Client.

### **D. Financial Reasons**

Delay of releasing the approved monthly progress payment to the main contractor was one of the financial reasons of client causes of delay.

### **7.A.3.2 Delays caused by the Consultant**

#### **A. Contractual Reasons**

The Consultant did not manage the design in a way that was best suited to the project condition where terms and condition of the contract did not comply with the project specification and the Client's requirements. Meanwhile, the delay of Consultant's approval of the Contractor's submission for the materials and detailed working program was not approved and returned to the contractor on time. Due to the shortage and lack of the Consultant site staff, the contract duration was estimated too optimistically without any consideration to the difficulties of the execution. Wrong procurement strategy was also approved without verification to the contract documents, where many terms and conditions in the agreements of the nominated subcontractors was not to the benefits of the project and the Client as well.

#### **B. Technical Reasons**

Due to the projects squeezed duration and the shortage of the Consultant's site staff, many mistakes in drawings and specifications have occurred and many errors in the Bill of Quantities were also found. Slow response from the Consultant to technical inquiries from the contractor was normal and the flexibility of the alternation options for material changes was not allowed. Much information was also missing from the drawings where the flexibility of the Engineer in changing the routine of inspection was not available. It was also found that the sub-surface of site conditions were different from those stated in the contract document.

#### **C. Legal Reasons**

The limited working time of the Consultant's site staff and the government regulations and laws (due to site location) were the legal restrictions that contributed to project delay. Restrictions conditions of Public Liability and the necessary follow-up the insurance requirements subject with Main Contractor and Sub-Contractor as stated in the particular conditions of the contract were some of the legal reasons. The system of filing correspondence between the Client and Main Contractor during tendering stage was not maintained properly were also some of the main causes.

#### **D. Financial Reasons**

Because the contract was lump sum contract, there were difficulties in dealing with missing items in the Bill of Quantities. Also, there was no flexibility of changing the financial issues of Prime Cost rates and provisional sums of some elements. Regarding the monthly valuation of the main contractor it is taking longer time to verify and approve more than what is specified in the conditions of the contract.

#### **7.A.3.3 Delays caused by the Contractor**

##### **A. Contractual Reasons**

Improper study of contract documents during bidding stage due to the limited time and acceptance of the Main Contractor to mobilize before dewatering and enabling Contractors who handed over the site to the Client where the Client should handover the site to the main contractor (noting that the site had very restricted working space) were the two contractual reasons caused by the contractor.

Delay in submission of the master work programme (Clause-14 Programme) due to lack of information of nominated Sub-Contractor's; and the acceptance of the Main Contractor to sign the contract before issuing all drawings and details, quantities and prices for fit out works were some reasons caused the delay. Entering the subcontract agreement with all nominated Sub-Contractors based on the Consultant's instruction while some conditions were still not clear, such as the advance payment, retention and handing over clauses were also some of the main reasons caused the delay.

##### **B. Technical Reasons**

The followings are some of the technical reasons contributed by the contractor to project delays:

- Improper construction method implemented by the Sub-Contractors and the qualification of nominated Sub-Contractor staff.
- Difficulties in design execution, since the building features very unique in Dubai, specially the front elevation and the low skills of manpower, since they have not executed a similar project.

- Failure of equipment which was used for de-watering (dewatering was carried out by a nominated Sub-Contractor) and less space of the material storage.
- Delay in material delivery due to changes, and some other financial problems.
- Continuous changes by Client in finishes, light distribution, block wall replacements etc. during his irregular visits to site.
- No proper useful questions and inquiries rose about some unique technical aspects during bidding stage from Contractor to Consultant.
- None of experienced Contractor's Project Managers was involved during bidding and negotiation stages for giving his opinion about project technicalities and difficulties of execution due to the site location which is very confined which prevents them to fix the tower crane at early stage of the project.

### **C. Legal Reasons**

- The Contractor's failure to obtain the required traffic permits because the area around the site was very busy. The front road was not allowed to be closed except one lane only after midnight (from 12:00 a.m. till 3:00am). Therefore, the Main Contractor had to cast concrete during this period only, and he had to deliver his material with the rest of Sub-Contractors during that period. Other three sides of the works had as access potential.
- Being a residential area, the Contractor had to get permission from the Cultural Department of Dubai Municipality to work at night shift as legally it is not allowed to work during night.
- Issues of the above conflict were raised with the Client for resolution after signing the contract. Permission was obtained one month of the project starting, by which time the Contractor had been seriously affected.

### **D. Financial Reasons**

- Failure of Contractor to receive payment on time because of changes.
- Planned cash flow and the payments of nominated Sub-Contractors were significantly disturbed due to changes,
- Variation and change orders had affected material suppliers because of which they stopped the supply of materials by local purchase order and demanded cash for any requested materials.

#### **7.A.4 WORK PROGRESS IN GENERAL**

Once the contract was signed, the project file, contract documents, tender drawings, Bill of Quantities, Specifications and the Tentative Construction Programme (Figure 7A-5) was given to the Contractor's Project Manager to commence the work. He was forced to prepare the technical site staff with a period of eight days since the work must be started after two weeks of signing the contract. The nominated Sub-Contractor for the excavation was still working on site and the dewatering system was not working effectively. This prevented the Main Contractor starting work on time. Most of the required important permits were issued and the work of substructure works started. The Main Contractor was facing difficulties working on these items (the problem is specified in next section of this chapter) then the super structure works continued with all difficulties. Referring to the work programme (Figure 7A-5), the structural works were to be completed within nine months and the whole project finished within fourteen months, which was a seemingly impossible task. Working with a full capacity enabled the Main Contractor to finish this work earlier than programmed. Five months was left to handover the project to the Client and none of the elements of finishes works which were mentioned in the programme started during this period except for roofing, masonry (block and plaster) and MEP works. Considerable efforts were made by the Contractor to accelerate the Client's and the Consultant's decisions making on important work items such as fit-out works, internal flooring and wall, external granite cladding, carpentry and joinery and industrial raised floor tiling etc. Late decision was made on these items because the Client was not able to choose or define the exact requirement and the Consultant was not able to accelerate his decision making on these points.

Due to the observed delay, a clear action was taken by the Client for approving some items but with major changes of details and requirements, especially in external wall cladding and fit-out works with different types of false ceiling. This had disruptive affect on the whole work programme.

The MEP Sub-Contractor was forced to redo the executed work again (such as A/C ducts, water (hot and cold pipes), sockets and switches), which had already been completed in some plastered walls.



Some works has to be re-constructed when the final drawing of decorations and joinery were approved and received at a very late stage (during 10<sup>th</sup> month); note that more than eighteen items of fit-out works as listed on Section 7A.2.4 in this Chapter has to be supplied and fixed. A large numbers of tools, equipment and materials had to be load shifted and distributed to all floors with the necessary manpower to execute the work.

The Main Contractor was not able to remove the hoist (temporary lift) until the fit-out works finish on all floors, especially the last floor where the super deluxe flats are located. This has affected fixing the glazing and granite wall marble cladding on the elevation where the hoist was fixed. Another problem was confusing all Sub-Contractors and Main Contractor was on fixing the special lamart laminated glass for the 14m circle diameter located on front elevation as shown in Figure 7A-3. Many finishes terminated at its boundary, such as false ceiling, gypsum work, paint, marble inside and all around the circle, light fittings and the automatic aluminium doors including special scaffolding which fabricated specially for fixing the glass.

The Main Contractor also faced another big problem relating to the fixing of spider wavy glass supported by heavy-duty stainless steel tubes. From the centre and the edges those tubes had to be fixed to the concrete sheer wall every 3 meters, from mezzanine level all the way up to roof level as shown on Figure 7A-3. Note that this type of work was being implemented for the first time in the Gulf and nobody had the experience to execute this type of work. Major co-ordination and much time were spent by the Consultant, Contractor, Aluminium Sub-Contractor, Granite Wall Cladding Sub-Contractor and Cleaning Equipment Sub-Contractor to finish this work safely. It had to be executed manually with qualified skilled people, scaffolding, tools, cradles, safety officers. If the Consultant had been aware of how difficult this proved to be to execute it is unlikely he would have agreed to hand over the project in the 400 days as the Client requested from him.

In addition to all these problems a lot of variations and additional works was requested either for replacement, additional work or omissions as listed on next Table 7A-1. This also had an affect on the project duration. The Contractor's Project Manager was dealing with all these variations, nominated Sub-Contractor and provisional items

contractually and it required more than 219 letters to be issued from Main Contractor to the Consultant.

Although many disputes occurred, the Main Contractor never stopped the work as a consequence of awaiting the response or reply of any dispute or claim and he was pursuing. Full records of communication, contractual and documentation for all site instructions, letters and documents of Consultant and Sub-Contractor which were received was of great benefit to the contractor for the final claims at the end of the project. The Main Contractor had prepared and submitted a claim to Consultant during substantial completion of the project. The subject of claim was substantiated and all documents, facts, reports, revised programme, etc. were submitted as a record of facts.

The Client agreed to grant an extension of time and pay all additional cost to the Main Contractor for a period of three months of the four that the Main Contractor had requested. It was reduced to three months on the recommendation of the Consultant.

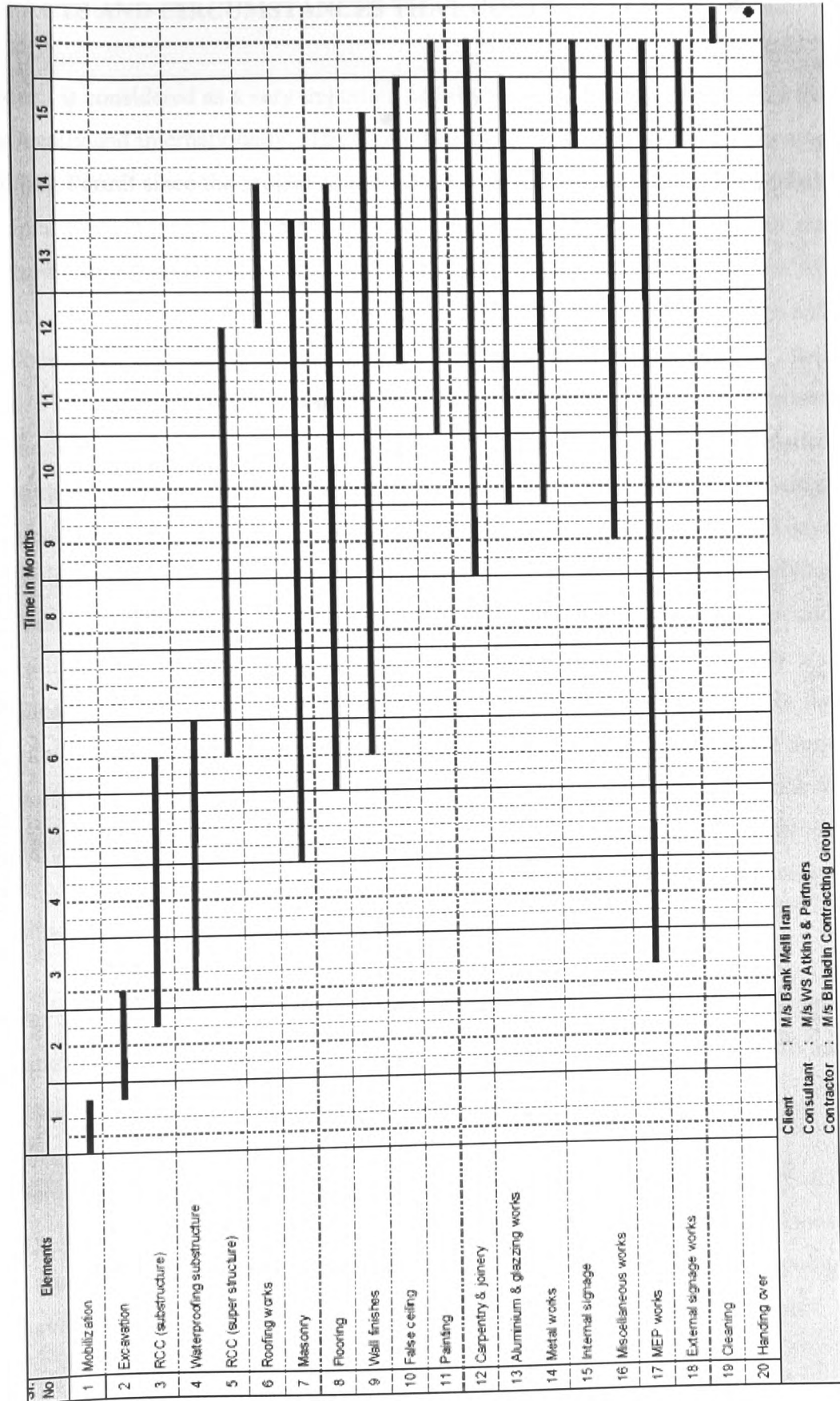
The Client admitted on completion of the works, for similar projects for such complexity of design and construction, that a project management approach would be used. He saw this as a means to reduce problems caused at the design construction interface. He also made complementary comments about the Main Contractor's Project Manager, the final quality of the works, and the absence of serious accidents during construction.

TABLE 7.A-1, List of Variations

<b>BANK MELLI IRAN REGIONAL HQ BUILDING</b>				
<b>BINLADIN CONTRACTING GROUP (LLC)</b>				
<b>VARIATION ORDERS</b>				
V.O. #	Description	Addition (\$)	Omission (\$)	Revised Contract Value (\$)
	Original Contract Value			27,000,000.00
1.	Expenditure of Provisional Sum – MEP		(264,712.00)	26,735,288.00
2.	Deletion of Anti Termite Treatment		(4,025.00)	26,731,263.00
3.	Deletion of Block work		(4,271.62)	26,726,991.38
4.	Deletion of one wall mounted Air Damper		(40,500.00)	26,686,491.38
5.	Concrete Breaking	3,820.00		26,690,311.38
6.	Conveyance system		(708,750.00)	25,981,561.38
7.	Vertical Transportation System - Car Interior and Landing Doors Finish	8,577.90		25,990,139.28
8.	Drawing Issue		(51,983.18)	25,938,156.10
9.	Traffic Guard UR 150 by Fosroc - Cost Saving		(8,095.00)	25,930,061.10
10.	Deletion of ID Works from BCG Scope		(351,948.17)	25,578,112.93
11.	Deletion of Vehicle Detection Units		(31,840.00)	25,546,272.93
12.	Supply and Fixing of External Cladding		(316,641.31)	25,229,631.62
13.	Internal Marble cladding and Flooring replaced with Granite Tiles		(34,628.00)	25,195,003.62
14.	Sanitary Fittings and Accessories		(66,035.00)	25,128,968.62
15.	Kitchen Appliances		(16,534.00)	25,112,434.62
16.	Interior Design Works	101,334.00		25,213,768.62
17.	Structured Wiring		(553,500.00)	24,660,268.62
18.	ID Package - Lighting System	128,843.00		24,789,111.62
19.	Issue of Services Drawings	637,480.01		25,426,591.63
20.	Ironmongery to Timber Doors		(20,187.50)	25,406,404.13
21.	ID Package – Ironmongery	23,318.17		25,429,722.30
22.	Revised Internal Marble works		(368,357.57)	25,061,364.73
23.	Revised ID Package		(55,731.50)	25,005,633.23

24.	Revised ID Package		(55,036.15)	24,950,597.08
25.	Internal Signage		(96,334.00)	24,854,263.08
26.	Revised ID Package Contract Value		(2,801.99)	24,851,461.09
27.	Revised Structured Wiring Contract Value	6,541.55		24,858,002.64
28.	Deletion of Landscaping and Irrigation Works		(205,000.00)	24,653,002.64
29.	Revised Structured Wiring Contract Value		(21,076.05)	24,631,926.59
30.	Replacement of Regular Raised Floor Tiles	90,349.00		24,722,275.59
31.	Computer Room - Power Distribution	5,911.37		24,728,186.96
32.	Revised ID Package Contract Value		(14,088.92)	24,714,098.04
33.	Cross Over at Roof		(6,360.00)	24,707,738.04
34.	Revised ID Package Contract Value		(35,260.82)	24,672,477.22
35.	Revised ID Package Contract Value	2,386.33		24,674,863.55
	<b>Total</b>	<b>1,008,561.33</b>	<b>(3,333,697.78)</b>	
	<b>Net Variation</b>			<b>(2,325,136.45)</b>
	<b>Revised Contract Value</b>			<b>24,674,863.55</b>

**3B+G+M+9 STOREY - REGIONAL HEADQUARTERS BLDG, DUBAI  
TENTATIVE CONSTRUCTION PROGRAMME**



**Figure 7.A-5: Tentative Construction Programme**

#### **7.A.5 FACTS AND CIRCUMSTANCES THAT CONTRIBUTED TO DELAY**

This project is considered as a very important activity to Dubai Emirates for serving the country locally and internationally. The Client had faced many difficulties in obtaining the Building Permit since the project combined two roles: Commercial and Residential. Restrictions were imposed on the Client from Municipality and Central Bank for the architectural appearance of the building, location, number of floors and special specifications. The Client chose a very reputable Consultant to prepare the design and tender documents but the Consultant's staff had a high work commitment to other projects. The Client requests to finish all tender documents to meet the bid date, meant that the architects' and designers' performance of preparing the scheme design, detailed design with drawings or tender document including the Bill of Quantities, Drawings and Particular project specifications, was impaired. The project was completed 90 days later than its original handing over date. The question is what and where the underlying reasons behind the project delay of three months? Noting that, both the Contractor and the Consultant had very good experience of executing this type of project locally and internationally. As referred in Section 7A.3, all the parties who were involved in the project (i.e. the Client, the Consultant, the Contractor and the Client's nominated Sub-Contractors) were all contributors to the delay. A time extension was inevitable due to the complexity of the project during design and execution. This fact was observed during execution through the changes requested by the Client, changes in the design technicalities and materials replacement especially in fit-out works.

Any discrepancies in Contract and tender documents, especially drawings and specifications, will almost inevitably affect on the execution stage, and will disturb the project cash flow and financial status of the project.

The Client failed to appoint a project management organization to prepare the necessary preliminary studies, to supervise the design and to advise on the most suitable type of contract, and to match the Client's requirements. The following points should have been fully discussed with the Client to avoid the potential delay reasons:

- 1) Giving more than 35% of the total contract amount to nominated Sub-Contractors.

2) The unrealistic contract duration of 400 days is not reasonable due to the followings:

- a. Nominated Sub-Contractors and Provisional Sums included but the scope of works, drawings, technicalities and Subcontract Agreements were not proposed.
- b. The complexity of the structural design both in the Substructure and Superstructure elements of the project.

**i. The Elements of the Substructure Works**

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>▪ Retaining walls around basement of thickness 30cm, height 13m from raft</li><li>▪ Three basement</li><li>▪ A very thick raft (1.35m)</li><li>▪ Water tank</li><li>▪ Three ramps</li><li>▪ Lift cargo lift</li></ul> | <ul style="list-style-type: none"><li>▪ De-watering pumps</li><li>▪ Waterproofing works</li><li>▪ Very confined place</li><li>▪ Manual shuttering (no place for equipment)</li><li>▪ MEP Contractor was not defined (nominated)</li><li>▪ No crane.</li></ul> |
|---|---|

**ii. Superstructure Works**

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>▪ The vault works (nominated)</li><li>▪ Mezzanine height 5:0 meter</li><li>▪ Shear walls locations</li><li>▪ Continuity of Dewatering</li><li>▪ Supports of adjacent building</li></ul> | <ul style="list-style-type: none"><li>▪ Opening of the front elevation</li><li>▪ Inclined concrete wall</li><li>▪ Long spans drop beams</li><li>▪ Site congestion</li><li>▪ Traffic Problem</li></ul> |
|---|---|

3) Releasing the fit-out drawings of each floor along with the specification at very late stage.

4) The Client's intention to let items for the excavation of the raft and the three basements to a nominated Sub-Contractor.

5) Dewatering Sub-Contractor and excavation Sub-Contractor were under the direct control of the Client. No proper coordination between the Consultant and the Main

Contractor especially as the pumps had to be switched off when the Main Contractor is working on 5th Floor.

- 6) No limitations on changes instigated by the Client during execution. Consultant should advise the Client to reduce changes to a minimum, especially during finishes stage.
- 7) The Main Contractor was not involved during the negotiations with the nominated suppliers by the Client and the Consultant.
- 8) The approval process and the time for approving the submitted samples were not flexible by the Client and the Consultant.
- 9) The lack of the required information needed to manufacture the special film of the specified glass located in the big circle of the front elevation. The Consultant and the Client refused the contractor's proposal of changing the glass and the film specifications which was very difficult to manufacture and unique.

The above nine points could be considered as primarily emanating from the Client and the Consultant and contributed directly to the project progress. It was only as a result of co-operation between the Resident Engineer, the Contractor's Project Manager or a nominated Sub-Contractor that the affect of resulted delays were kept to a minimum. Regular constructive meetings between the above three parties ensured a pro-active approach to mitigating delay during construction.

There was also the opportunity to reduce or avoid some of the above problems available to the Contractor during the bidding and tendering, by raising technical queries with the Consultant. The Contractor's faults which caused the delay could be summarized as follows:

- a. Sufficient time was not required to study the contract documents and drawing with specifications.
- b. The items in Bill of Quantities were not compared with the tender drawings and the finally approved drawings for construction.



- c. The quantities taken from drawings were not compared with the quantities listed in the Bill of Quantities and pricing unit.
- d. During the tendering, pricing and final price negotiation, nobody from the tender department referred to an experienced, project manager to give his opinion about the contract amount, construction method, “buildability” and “project constructability”.
- e. No condition or terms were requested by the Main Contractor during signing the Contract with the nominated Sub-Contractors, Suppliers, dates, penalties etc.
- f. Ignorance of tender department about the drawings and details of works for nominated Sub-Contractor and provisional sum items.
- g. The complete site survey was not done by the contractor during tender stage.
- h. None of tender department engineers referred to public authorities to check the special permits required for the site location, which is very congested and located in center of Dubai at Al-Khor of Dubai.
- i. The acceptance by the Main Contractor to start mobilization and commencement before the excavation Sub-Contractor completed official hand over of his work. This caused major confusion in the first month of work with the Main Contractor not being able to mobilize on time.
- k. Insufficient time allocated to the project manager to study the drawings, Bill of Quantities, and specifications after signing the contract (the pre-mobilization period was not enough).

Most of the above points directly affected the performance of the Contractor both technically and financially. Many discrepancies in the Bill of Quantities were discovered during execution, which forced the Main Contractor to increase the resources, where costs have increased. This caused major changes to the expected cash flow and monthly payments since the Contractor is obliged to execute the work as outlined in the Bill of Quantities and Drawings. The change to the anticipated payments created problems to the material suppliers. Most suppliers failed to supply materials on time to the project due to financial problems with the Contractor and Sub-Contractors. This created a shortage of materials which led the project manager to transfer manpower to other sites for cost reducing purposes.

The project was finally handed over incorporating all the required changes and overcoming the obstacles, their effects were reduced in part, by the experience of the Contractor's Project Manager. Key activity skills for the effective management of this type of work were applied by the Project Manager, namely:

1. Planning : Breakdown, scheduling and costing
2. Organizing : Team work, reports, staff monitoring
3. Leading : Motivation, Controlling the conflict.
4. Controlling : Project review technique, skills, project close out.
5. Communicating : Listening, persuading.
6. Documentation : Variations orders, reports, minutes of meeting.

All events, correspondence, letters, claims, variations and follow-up and coordination with Sub-Contractors were monitored on a day-to-day basis. This was based on verbal/written instructions and through regular meetings with all involved parties and site staff. The Contractor's Project Manager succeeded in gaining an extension of time of three months with the cost associated paid from Client. Some penalties imposed on nominated Sub-Contractors were deducted from their final account and paid to the Main Contractor. This was based on the correspondence between the Contractor's Project Manager and Sub-Contractors owed the copies sent to the Consultant.

#### **7.A.6 SUMMARY OF CASE STUDY-I**

From the analysis of this case study, it is observed that the problems and the reasons caused the delay are consistent with the general causes of delay presented in Chapter 5 regardless the level of contribution to the delays. It is evident that this problem is a major common problem which should be considered by all project participants to avoid and mitigate delays.

The causes of the delay in this case could be summarized as follows:

- The Client has not appointed a project management firm to manage the design process of the project.

- Lack of coordination between project participants regarding the shortage of space around the site and traffic regulations of the area where the project is located.
- The Client did not organize any joint meeting between the excavation Sub-Contractor and the main Contractor. This created many problems once the excavation Contractor handed over the site to the Client.
- The Client awarded more than 35% of the total contract value to nominated Sub-Contractors who worked directly under the Client's umbrella e.g. MEP works, external wall cladding and excavation.
- Multi-changes in the finishing item were initiated during the finishing stage, which were issues through irregular site visits.
- The Client nominated the only American supplier in the world to design, supply and install the unique glazing of the front elevation without referring to any local specialists in the glass manufacturing.

It can be seen that all the three parties could be blamed to some extent for the delay that occurred on the project. In this particular project, the Client and the Consultant contributed more to the project delays. For example, the design of this project should have been evaluated and approved by a suitably qualified Client Representative (e.g. from a project management firm). Since the Client was not an engineer or familiar with project technicalities and contract documents, independent advice at this stage would be likely to benefit the overall project implementation.

As stated by **Kimmons R. (1990)**, *"The Client will require a representative to perform tasks on his behalf such as studying feasibility, obtaining consents from regulatory bodies, drawing up of the formal brief, preparing the concept design and outline specification and administrating the construction stage"*. Only when the appointed Client Representative understands both the project objectives and the Client's requirements, can a suitable selection for procurement method could be made. The appointed representative must make the Client aware of the complexity of his project, allow him to separate design from construction management, give him a feasible projection of duration from inception to completion and provide a feasible budget.

Another important factor must be understood by the Client is the selection of appropriate type of contract. This decision has to be made on before the preparation of tender documents because the speed, cost, duration, economy, value and the type and size of building will need to be considered before choosing an appropriate form of contract. From practical experience the choice of the Contract could be determined by understanding the required project duration, level required nomination, type and size of project, the source of the expected budget and the level of project complexity. **MacCaffer R. (1986)** also confirmed that *"Before the Owner can begin to choose a Contracting Method, they must gain an initial understanding of the project, such as design parameters, schedule needs, cost, details and complicated items. A Consultant may be needed to help the Owner to formulate this information"*.

Design management is another issue to be considered and monitored by the Client representative and Consultant. Due to the limited availability of experienced representatives to advise the Client for this unique building in Dubai, the Client decided the duration of the project should be 400 days, without understanding the scope of project and project objectives in full details. The Consultant accepted the period and started the preparation of the detailed design, drawings, contract documents and Bill of Quantities. Because the Consultant office was objected to risk loosing, and the Consultancy was carrying a high workload, this has caused the selection of the inappropriate contract type and contract procurement strategy, mistakes in drawings and bill of quantities, and wrong implementation to the design management.

Above all, the Client and the Consultant could be blamed for a major proportion of the delay in this project, since they both agreed to build the project in 400 days without understanding the whole project package, contractually and technically. On the other hand, the Contractor could also be blamed, for reasons mentioned in previous sections, and he was in a position to advise both the Consultant and the Client during the tender stage about Contractual, legal and technical issues that in his experience were likely to adversely influence the progress and cost in the construction stage.

## **7.B.1 BRIEF DESCRIPTION OF THE PROJECT**

### **CASE STUDY – II: PROJECT ‘B’**

#### **ESTABLISHING REGIONAL HEAD QUARTER OF NESTLE MIDDLE EAST AT FREEZONE AREA IN JEBEL ALI, FZA, DUBAI**

##### **7.B.1.1 CONTRACT DETAILS AND CONSTRUCTION**

Project title	: Basement + Ground + One Floor Offices - Regional Head Quarter Building of Nestle Middle East, Jebel Ali Free Zone.
Locations	: Roundabout No.13, Plot M00601 Jebel Ali Free Zone, Dubai.
Client	: Nestle Middle East P. O. Box 17327, Jebel Ali FZE, Dubai, U.A.E.
Consultant	: C.A.B Consultants P. O. Box 5421, Sharjah, U.A.E.
Contractor	: Saudi Binladin Contracting Group P.O. Box 1555, Dubai, U.A.E.
Award of Contract letter	: 23-09-1999
Engineers order to commence	: 15-11-1999
Duration of construction including Mobilization	: 345 days
Contract Completion date	: 31-10-2000
Original Contract value	: Dhs. 28,478,352.00
Revised Contract value	: Dhs. 30,605,320.00
1st Revised Completion date	: 31-12-2000
2nd Revised Completion date	: 31-03-2001
Defect Liability Period valid till	: 31-03-2001
No. of Nominated Sub-Contractors	: Three numbers
No. of Domestic Sub-Contractors	: Twenty Three numbers
Extension of time granted	: 150 days

Overhead against cost of extension granted : Dhs. 230,000.00  
Type of Tender and Contract applied : Traditional procurement approach  
Contract Conditions applied : FIDIC Conditions and Terms of Contract

### **7.B.1.2 PROJECT BACKGROUND**

The project is located on Plot No. M00601 in the corner of two main roads at round about no.13 in the Free Zone Area, which is located in Jebel Ali in Dubai. The approximate area of land is 15,500 m<sup>2</sup> and the total buildup area is 7,171 m<sup>2</sup>. The rest of the area has been occupied and used for car parking, landscaping, access roads for cars around the building, side walks and some other service facilities such as guards control room, garbage rooms and main transformer room.

Nestle perceived to establish a regional head quarter for their Middle East and Gulf Business operations. One of their targets of building this project is to increase the overall efficiency of their employees and quality of its products by ensuring that the new project offers a state of art facilities to support its operations.

Nestle selected a Project Management firm to study, plan, investigate and select the suitable location and establish the proposed building which was to be designed by a local Consulting office. The final project appearance, functional and the performance were carefully considered during the planning stage by the foreign Project Management office and the local Consultant.

It was decided, by the senior management in Switzerland, that a project culture was created and integrated to define the briefing and design stage. The project information as evaluated by the top management in Switzerland and by understanding the project scope, a detailed functional project brief was proposed. Actions were taken on the basis of advice supplied by the appointed project management office located in Switzerland. A Consultant was also selected to translate all the Client's requirements for a design into a schematic drawing, under the supervision of the project management office. The Consultant successfully designed the building with unique design and architectural features. The landscaped surroundings of the building designed and

executed created an extremely attractive environment. The unique design and the associated planning required meeting the appearance and functionality, required the appointment of an experienced Contractor. The work was executed and monitored carefully with the full involvement of the Consultant, especially with respect to the quality of work required by such a prestige project. Construction of the three floors building (basement included) with all finishes was not an easy task to complete in the required construction period of one year.

### **7.B.2 BRIEF DESCRIPTION OF THE PROJECT SPECIFICATIONS**

The building structure consisted of one basement, ground floor, first floor, large atrium, sky light conference hall and roof. The total built-up area is 7,171 m<sup>2</sup> with centralized air-conditioned. A modern lift was provided to take people from the basement to ground and first floor. A long cantilever staircase built to serve employees from ground to 1st floor. Modern electrical, mechanical and plumbing systems and features were provided in this building, with security systems, fire protection, and safety facilities have being provided to all rooms and offices as per latest standards.

The basement floor consists of car parking for 33 cars, cafeteria for employees, fully equipped gymnasium, mosque and ablution block, toilets for ladies and gents with changing rooms, electrical and telephone rooms, training hall, Store and three further rooms. The total of built-up area was of 2,415 m<sup>2</sup>.

The ground floor consists of food laboratory, offices, the main reception hall, theatre, skylight conference hall, the atrium planters, wall partitions, sample rooms and security control units. The total built-up area of that floor was of 2,823 m<sup>2</sup>.

The first floor consists of solid and wooden partitions for rooms and offices, toilets, pantries, top executive management offices and the IT department. The area of this floor was of 1,933 m<sup>2</sup>. The area was subsequently reduced due to the atrium, which is covered by glass (to be explained in detail in next section). A large cantilever bridge connects the lift are to the right wings of 1<sup>st</sup> floor (area of 98 m<sup>2</sup>).

Roof is designed to carry the load from all the heavy equipment (A/C machines, compressors etc...) and to fix the supports of steel and glass of atrium and the concrete bases of cantilever aluminum canopy as shown on Fig. 7.B.1. This canopy is clad in aluminum sheeting (technical details will be explained in next sections).

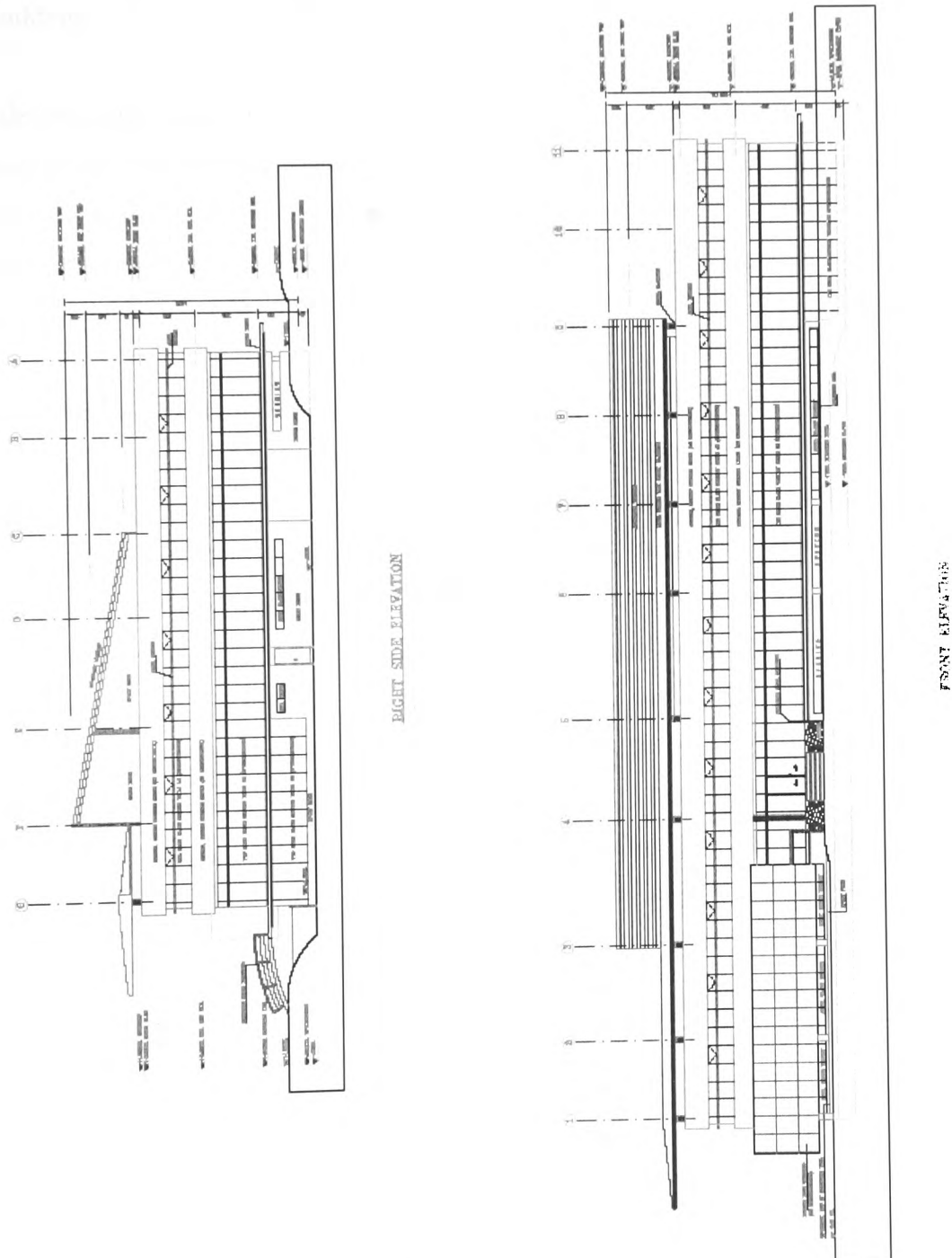


Figure 7.B.1: Front and Right Side Elevation



### **7.B.2.1 Sub-structure Works**

About 8,200 m<sup>3</sup> of excavated material had to be disposed off site to a disposed tip assigned by Dubai Municipality where the foundation of the building had to be excavated to establish the retaining walls of basement, and the combined footings for the building.

The de-watering system was installed to reduce the water table below the level for excavation and substructure works and waterproofing had to applied to all substructure works such as walls, footings, tie beams, neck columns, staircases walls and bottom of plinth level slab noting that the depth of excavation did not exceeding 3.0m below natural ground level.

### **7.B.2.2 Super-structure Works**

- Three post-tension slabs had to be cast for this project.
- The ground floor slab has to be cantilevered about 2.2m beyond the edge of the building on four sides.
- The up-stand beam of a height of 1 meter and thickness of 20cm had to be provided to the edge of slabs from four sides to be used as a kicker for the GRC Panels.
- The slab area of the sky light conference hall is of 196 m<sup>2</sup> (14m x 14m), located in ground floor, no columns are provided to hold the slab except the external columns which rise from the ground floor to the first floor. One beam only was provided of length of 14m, depth of 1m and width of 1.20m to hold the slab weight because there no column to support the conference hall slab and to provide support for mechanical external aluminium louvers with electrical control system to allow natural light for the hall if necessary.
- Providing large up-stand beams on the roof slab (post-tensioned slab) eight in number of size 3m length, 80cm height, 70cm width with a distance of 4m c/c. These beams are required to carry the A/C chillers, compressors, air handling units and fans. Note that no intermediate columns were required to take the load.
- Casting 16 concrete foundations size of 1m x 1m x 80cm on the roof to support for the truss steel beams which were covered in aluminium sheets to form the cantilevered canopy.

- Long up-stand beams and columns cast on the roof for use as supports for 'H' Steel Beams which hold the glass cover of atrium.
- Concrete screed works on all the concrete slabs in areas of 4 x 4m thickness 6cm, after laying all Electro-Mechanical junction boxes and conduits (horizontally).
- Roof and waterproofing work with providing the sound insulation system to avoid vibrations of machines.

### **7.B.2.3 Elevation of the Building and Special Features**

The Client and the Consultant insisted on a unique architectural appearance view for the building since it is located on the main roundabout in the Free Zone. The security fence is an open steel mesh, which makes the building highly visible from the main express way. Providing the aluminium canopy, which projects 6 meters from the roof (in front elevation and side elevation) and with the glass cover of the atrium has gives the building a very attractive architectural unique appearance. All sides of the elevations were cladded with aluminium, glass and Granular Reinforced Concrete wall panels, the colour of these two items was selected carefully for visual appearance. Front and side elevation which are seen from the roundabout have special black granite wall cladding 4mm thick to logos can be fixed. This can be seen in Figure 7.B.2



**Figure 7.B.2: Front Elevation Canopy and GRC Panels**

#### 7.B.2.4 Fit Out and Interior Design Works

The fit-out materials was supposed to be imported from Europe, based on the Client's request during the tendering stage to match the NESTLE Standards. Fit-out materials and works have to be to a very high quality. A nominated European Sub-Contractor was left to design and execute the job, under the Main Contractor's supervision and coordination. Fit-out work items was included in the Main Contractors contract period. The scope of works includes the supplying and fixing the following:

- |  |  |
|--|--|
| 1. Wooden partition.                                     | 7. Carpet.                               |
| 2. Wooden columns cladding.                              | 8. Vinyl flooring                        |
| 3. Steel columns cladding.                               | 9. Wooden skirting (straight and round)  |
| 4. Marble and Granite counters                           | 10. A decorative wooden floor.           |
| 5. Stainless steel handrail.                             | 11. Glass partition                      |
| 6. Combined gypsum and wooden ceiling in reception hall. | 12. Complete furniture for the building. |

#### 7 B.2.5 Electro-Mechanical Works (MEP)

The scope of this activity was implemented by the Electro-Mechanical Division of Saudi Binladin Contracting Group since it was included with the Main Contractor and was under their control. A very high quality of material was specified based on Client request. The scope of work was supplying, fixing and commissioning all works related to MEP Works such as:

1. Electrical Works	2. Mechanical Works	3. Plumbing Works
Light fittings	A/C Chillers, Compressor and A.H.U.	All pumps and their piping works.
Electrical panels	All ducting works	Drainage and Waste Water system
Switches and Sockets	Thermostats	Heater and Plant room
Fire alarm system	Grills and Diffusers	Internal Water features
Security, Camera and Safety System	Extracting fans	Kitchen connection and boilers
		Supply and Fix all Sanitary with all the fittings

### **7.B.2.6 Landscaping and all External Pavement**

20% of the contract value was allocated to external landscaping and external roads and pavement. The external works consist of the external roads and pavement and the landscaping.

#### **1. External Roads and Pavement**

- Car parking for 79 Cars, Interlock tile for Roads and Car parking and Kerbstone works.
- Fencing works (steel and all structural works include excavation, waterproofing and backfilling, steel doors for the main gate.
- Lining for roads (painting) and Painting of Kerbstone and some other civil builder's works for manholes, ST/SO.
- Supplying and laying decorative coloured aggregates for sidewalks and Interlock tile work for the side walks around the building.

#### **2. Landscaping**

- Replacing all the soil with agricultural soil for planting to supply and plant 30 number of Palm Trees. Establishing three hills 2m height covered with agricultural soil and making a sidewalk in side the hills and around the plants.
- Supplying a lot of rocks a size of 1m<sup>3</sup> irregular shape for ornament reasons and fixing all the watering piping system with drain net for planting.

### **7.B.3 INTRODUCTION TO CAUSES OF DELAYS**

This case study demonstrates a live example of the causes of project delays and explains how project participants contribute to the reasons of delay, which will be used as a major source of primary data for identifying the type of delays, and as a guide to the Contractor's Project Manager to mitigate the disputes and delays at a very advance stage of the project. The actual causes of project delays will also be examined and compared with the primary anticipated causes of delay obtained from the literature review and the questionnaires to determine the proper action of each participant (the Client, the Consultant and the Contractor) on how to act to reduce the delay.

Once the contract was signed, the project manager was appointed to manage the project on behalf of the Main Contractor. The tender and contracts manager and the project manager visited the site immediately on appointment as none of the contract department engineers had visited the site during the tendering stage. The Free Zone is 52km from the Contractor's Dubai head office, to the Main Gate and then another 23 kilometres to reach Roundabout No.13 where the site is located in Free Zone Area (FZA). From Sharjah where the labour camp and workshop are located main resources is of 110km, since the drivers have to use a different road (as per traffic department rules and regulations) for heavy traffic between Sharjah, Dubai and Free Zone Authority. The second problem noted was that nobody was authorized to enter the Free Zone without a permit or invitation, which had to come through the Client or the Client's Representative.

On this visit it took more than 30 minutes to have clearance to enter the Free Zone area while the permit pass was issued. On investigation it became evident that there were extensive formalities required for security clearance for entering or transporting out anything from or to the site. Many forms had to be filled and stamped by the Client's representative, Main Contractor and the related persons to get the permission for either material, persons and machinery to enter or leave the site.

This had not been fully considered as a delay in time and would impact on the special external building features and the fittings of the finishing materials which have to be imported from Europe. Also the post-tensioning works which has to be executed by a Sub-Contractor (NASA Multiplex Contracting) the only approved Contractor who can do this work in Dubai (Design and Execute). This would compound the access difficulties. In addition to the above, there are many reasons that contributed to delay of the project which will be discussed in the following sections.

#### **7.B.3.1 Delays caused by the Client**

##### **A. Contractual Reasons**

- Not continuing employment of the project management firm who prepared the project study for the Client once the Contract signed with the Consultant and the Main Contractor by holding their services.

- No Engineer appointed as the Client Representative to monitor the works technical progress and to explain the Client about the work sequences specially after issuing changes orders (Replacement of project management firm).

#### **B. Technical Reasons**

- Providing samples from the local market and trying to change the material specifications specially the nominated materials.
- Multiple changes during the Client top management site visit.
- A major change in landscaping and external pavement works.

#### **C. Legal Reasons**

- Failure of the Client to understand the issuance of procedure permits for establishing the project since the project is located in very important area in Dubai with Free Zone. The regulation and authorities of the Free Zone are separate from the Dubai Authorities rules. Free Zone has their own rules to guarantee the security, rules, quality and safety of works under their contract certain procedures has to be considered for project duration purposes.
- The Client's failure to issue the building permit for starting the construction work because of the procedures to be coordinated between the Consultant and the Free Zone Authorities before the issue of a work permit to Main Contractor. Note that the contract was signed with the Main Contractor and both agreed to proceed with mobilization within one week of signing the contract without noting that a work permit must be issued from Engineering Department of the Free Zone. The work permit takes longer than 3 weeks for issuance and approval.

#### **D. Financial Reasons**

- No financial reason was encountered since the Client is well-known internationally, and payment problems did not arise.

### **7.B.3.2 Delays caused by the Consultant**

#### **A. Contractual Reasons:**

- No proper communication and coordination was considered for the issuance of work permit for the building.
- Shortage of Consultant Site Staff (non-availability of the Resident Engineer).
- Direct coordination with the nominated Sub-Contractors of furniture in terms of Contract conditions, work programme, payment, supervision etc without referring to the main contractor.
- Removing some items from the scope of the Main Contractor and awarding them to other Sub-Contractors through direct coordination with Consultant.

#### **B. Technical Reasons:**

- There was no proper coordination between structural and Electrical and Mechanical drawings for installation of the A/C Equipment on roof).
- Mistakes in drawings, dimensions and structural works affected the post-tensioning works designed and executed by a Sub-Contractor.
- The representative of the Consultants Engineer was not able to communicate directly with the nominated Sub-Contractors during the regular site meetings (could not speak or write in English - translator was required).
- Multiple changes in finishing items specially walls and floors tiles disturbed the cash flow of work in progress due to the omission and addition to the quantities of those items.
- The level of Site Consultant Staff's technical interaction during inspection, discussion of technicalities and the level of communication and supporting documentation, needed improvement.
- Technicalities relating to the sequence of work of the nominated Sub-Contractor (Fit-out and decoration works) was not clear to the Consultant Site Staff which created conflicts with the Main Contractor's activities.

**C. Legal Reasons:**

- Failure of the Consultant to arrange the approvals from the engineering department of Free Zone to run and monitor the work. He was forced to pay additional fees to other approved Consultant to use their name as an official for all correspondence to Free Zone Authorities for the issue permits, approve the drawings and inspection of activities.
- The approved Consultant was CONIN Consultant Office, which created additional administration delayed the paper work (especially during inspection). A person from CONIN had to be present on site during inspection this was not always possible, which caused delay in obtaining permits to precede with other work activities on occasions.

**D. Financial Reasons:**

- Disputes raised regarding the method of measurement between the Consultant and the Main Contractor, for the prices of additions and omission of quantities since the specified materials had been changed.

**7.B.3.3 Delays caused by the Contractor**

**A. Contractual Reasons:**

- The contract documents and conditions of contract were not studied in detail during the bidding stage. Signing the contract and acceptance of mobilization date before verifying that a work permit for the project issued by the engineering department of FZA was another major reason.
- Signing the contract before they had obtained a copy of drawings of the fit-out and interior design drawings and the Acceptance of the Provisional Items and nominated Sub-Contractor activities without their supervision and control (technically, contractually and financially), implication being clarified had also caused problem.



**B. Technical Reasons:**

- Difficulties of controlling the post tensioning works (a part of structural works) since the design and coordination drawings had to receive prior to the approval by the Engineering Department of FZA.
- Obtaining the final approval for the GRC Panels of the faced cladding since the drawings of GRC Panels drawings were not finalized.
- The construction of the floor slab of the conference hall encountered had difficulties, which caused the Consultant to modify the design to satisfy the Client's request to dispense with columns inside the hall of the conference theatre.
- Technicalities in executing the cantilever canopy were not very clear and no proper method of statement was submitted at the early stage of the work. Also, the final specifications for the cladding were changed at the very late stage.
- Method of fixing the I and H Steel Beams in the atrium roof to accommodate the ceiling.
- The major work component details were not clear on the drawing for GRC, glass and false ceiling (matching details).
- No substructure details for all external fencing works, as well as other landscaping pavement work details were available at the start of the contract.
- No proper technical inquiries were raised during the bidding stage from the Main Contractor to the Consultant.
- A multiple changes of room dimension, sizes and wall replacement occurred during the Client's irregular site visits.
- The Contractor faced problems with the technical aspects of the fit-out works and in obtaining the drawing details from the Consultants site representative during construction.

**C. Legal Reasons:**

- Failure of the Contractor to gain the permission for accommodation to his site staff and manpower inside the FZA, and camping area. This service is available to all Contractors, but because this was not investigated at tendering stage, the approval

came at very late stage and the Main Contractor lost many working hours transporting his manpower to and from site (cost of transport and time of production).

- The Contractor was fully not aware of all legal conditions and roles of the Engineering Department and Free Zone Authority relating to project and contracting prior to becoming involved in the project. This affected the duration for start of the project and delayed the handing over the project.

**Yogeswaran K. and Miller D. (1998)** confirmed that *"The Contractor is also obligated to expedite the Progress in the case of non excusable delays. It may be possible that the sequence of works in the project and thereby meet the original completion date"*. The above legal reasons are not excuses for the Contractor and he should accelerate the work to avoid the delay.

#### **D. Financial Reasons:**

- The planned cash flow was affected due to changes and variations. This was discipline to the suppliers and Sub-Contractors payment. Credibility of the contractor has been affected in the market which reflects the work performance.

#### **7.B.4 WORK PROGRESS IN GENERAL**

The Main Contractor was not able to proceed any mobilization work until the third week of commencement date due to the delay of issuance of building permit of FZA Engineering Department.

The project manager of Main Contractor attempted to obtain all requirements from all authorities through working pro-activity with following up between the Consultant, authorities and engineering department. In the last week of Dec.1999 the work permit and building permit were granted. The Main Contractor decided to begin the work of mobilization together with the excavation and earthworks, to reduce some of the delays incurred. By mid January, a permit to allow all the manpower to stay at the camp area in FZA (Housing section) was issued, this helped the Main Contractor to increase the

site working hours as the camp was very close to the site. The delayed period was almost recovered and the Substructure works started almost on time. During this period the Contractor's Project Manager was preparing all submittals for approvals, detailed working programme, contacting all concerned Sub-Contractors for price negotiations and sample submittals. Large discrepancies were found in the Superstructure works because the Architectural and Substructure drawings were not compatible with the proposed design of the nominated Sub-Contractor of the Superstructure works. This Sub-Contractor was suppose to design and execute the slab post-tensioning works and obtains final approval from the Engineering Department of FZA. A major effort from the Consultant, Main Contractor and NASA Multiplex Construction to achieve all the requirement needed for the approval process. The nominated Sub-Contractor of Post-Tensioning works was needed to gain final approval. Another delay occurred during the construction since NASA Multiplex was very busy on other works in the country and they did not have enough equipment to execute the work. The site was too far for the Technical Manager to attend regularly and to reduce technical problems that arise during the work. Overall, Substructure and Superstructure works was delayed approximately one month beyond the original specified period in the programme.

On 15th Feb.2000, the Main Contractor invited the Client, the Consultant and the Tender Contracts Manager to the site for approval of the samples which were required for the finishing works, as requested by the Resident Engineer. The samples included tiles, granite, marble, paints, windows, doors, metal works, aluminium works glass, glazed glass, all samples of roofing works, GRC Panel, the accessories of canopy and some landscaping works, etc. Within two consecutive working days the Main Contractor had succeeded in getting the final approval and signature for 70% of the samples presented during that period. A major subject was raised during that meeting which was the unavailability of the nominated Sub-Contractor of Interior Design (fit-out works). Neither specifications nor the drawings were available and most of the fit-out materials had to comply with the approved finishes items. The Main Contractors work was now critical and he confirmed officially that Contractual delays resulting from unavailability of nominated Sub-Contractor would be claimed for.

On 29<sup>th</sup> Feb. 2000, the Main Contractor received a letter from the Consultant for some additional works and modification, a copy of this letter is attached at the end of this

section. Most of the variations issued were because of the technical inquiries which were raised during structural works, such as the compatibility of the GRC Panels with the glass glazed curtain wall, the canopy and type of aluminium cladding (type of Aluminium Cladding was fully changed from top due to design inquires). The change of atrium stair location to suit the design, the width of concrete bridge of main entrance to be complied with specification of design criteria, extending the slab of the conference hall skylight, adding some structural columns to take increased span, and location changes of solid block partitions. The technical detail inquiries which were raised during structural works were not only from the Main Contractor but also from other Sub-Contractors such Aluminium Sub-Contractor, Post-tensioning works Sub-Contractor, Steel Structure Sub-Contractor and Electro-Mechanical works Sub-Contractors for the bases of A/C Equipment at roof. Some were additional variations in the attached letter arise from the day that the samples were presented for approval. The Client accepted the alternatives and on the basis of decision made, asked for changes.

During all these changes the Main Contractor continued working on site noting that all correspondence relating to variations and other work modifications were fully documented for the claim resulting from the Main Contractor's delay of two months for the handover of the project. The Main Contractor had noted the Client's increasingly regular site visits and unfortunately during each visit there were changes to finishing items. It became clear and there were delays in issuing the changes, resulting from poor coordination and communication between the Consultants representative and the Client following technical discussions on site visit. The Consultant's representative delayed the issuing of instructions until the Resident Engineer was in attendance. This delayed the approval order to the Main Contractor to proceed with any changed work. Under this contract the above would be considered as a valid reason in delaying the Contractor's work. Based on the above facts, the Main Contractor reached an agreement with the Client to extend the duration of the project by another two months with a revised completion date of 31<sup>st</sup> Dec.2000.

Regarding to external pavement and landscaping works, the Main Contractor started these works earlier than the date specified in the tentative programme because the area was large and there was an opportunity for the Main Contractor to finish most of the

works further away from the building such as, planting, watering, light fixing, landscaping and pavement with kerbstone works.

After finishing 75% of these works, the executive manager of main branch in Switzerland visited the site and gave instructions to remove all finished pavement and landscaping. The new requirement was for landscaping works with a wave level area with grass, flowers and some palm trees only. The implemented coloured interlock tile had to be removed and replaced by another of a grey colour.

He was informed that the scope of this work had been changed completely and additional time would be needed to demolish and reconstruct the whole item together with additional cost. He was fully aware of that and agreed another 3 months extension. The Client removed this item from the Main Contractors Bill of Quantity and hired their own nominated Sub-Contractor to do the external landscaping works with all required Electro-Mechanical fittings which are necessary such as pipes, lights, pumps and PVC elbows. The Clients nominated Sub-Contractor for the fit-out works (Interior Design Works) came to site at the final stage and they worked separately under the Consultants Supervision. The Main Contractor was not involved contractually, but problems were raised as a consequence of these works because of the interference in work activities during the final stages such as, painting, carpeting, wall papers, electrical sockets and switches, false ceiling and light distribution. Both Main Contractor and fit-out Sub-Contractor were very cooperative on the site because they were both getting paid for any changes instructed by the Client. If drawings and specifications of these items had been issued at an early stage and remain unchanged, handed-over would have been much earlier.

The landscaping and external pavement together with the Fit-out works could be considered a major cause for the delay in this Project. The Main Contractor had difficulties implementing the canopy because it has a very complicated design to execute. 6.0m of cantilever aluminium sheets projected from the two sides of the building at a height of 15m from the side walls of the building. The alignment of aluminium sheets from top to bottom of the cantilever canopy had to be fixed with a minimal deflection. An especial scaffolding had to be fabricated for this type of work, and had to be fixed / removed more than 5 times to allow the manpower access. This

also affected the Sub-Contractor for the GRC Works, Wall Panels, Aluminium Glazing Works and the Sidewalk works around the building, since the works on the Aluminium canopy cladding panels had been executed at a very late stage as a result of changes in the design. The project completely handed over on 30<sup>th</sup> of March 2000.

المكتب الاستشاري للمعمارة والهندسة المدنية

Consulting Architecture & Civil Eng. Bureau

دكتور محمد فائق هويدى Dr. M. FAYEK HOWEEDY



مهندسون استشاريون

Date 29 / 02 / 2000

تاريخ

No.

رقم

BinLadin Contracting Group (L.L.C.)  
P.O.BOX : 1555  
Dubai , U.A.E

Attn. : Eng. M. Tawanee – Manager Technical Affairs  
Eng. Mamoon Atout – Project Manager

Project : Nestle' Office Building at Jebel Ali FZE – Dubai – U.A.E  
For M/S Nestle' Middle East.

Subject : Modifications and Additional Work

Please find enclosed herewith 15 sheets of A3 size drawings for some required modifications work to the a.m. project .

The Modifications will be as follows :-

**Variation No. 1 : The glass curtain wall and the GRC panels at all elevations**

- The height of the glass curtain wall at the facade of the first floor will be extended up to the false ceiling level . ( will be 1-95 m )
- Accordingly the height of the GRC & RCC element at the upper part of the elevations will be shorter ( will be 1.15 m ).
- Increase the height of the GRC & RCC elements at the lower part of the elevations ( will be 1.65m ).

**Variation No. 2 : The canopy and Alum. cladding**

- Extend the canopy above the roof to cover the area from axis E to C ( 12.80 R.M ).
- All Honeycomb Alum. cladding panels size will be 3.00 x 1.20m .

Tel. : 2911473  
Tel. : 5355348  
Tel. : 761911

Fax : 2918980  
Fax : 5522673  
Fax : 761912

64 Beirut St., Heliopolis  
P.O. Box : 5421  
P.O. Box : 45077

٦٤ ش. بيروت مصر الجديدة  
ص.ب : ٥٤٢١  
ص.ب : ٤٥٠٧٧

فاكس : ٢٩١٨٩٨٠  
فاكس : ٥٥٢٢٦٧٣  
فاكس : ٧٦١٩١٢

تليفون : ٢٩١١٤٧٣  
تليفون : ٥٣٥٥٣٤٨  
تليفون : ٧٦١٩١١

- c. The Alum. cladding above the canopy will be of Alum. Sandwich panel 0.70mm thick with approved powder coated colour

**Note :** The lower Alum. cladding will be the same specified honeycomb cladding as per the original contract documents.

**Variation No. 3 : The atrium planters**

- a. For the planters shape and size .

**Variation No. 4 : The atrium steel stair**

- a. For the steel stair at atrium, the location will be changed.

**Variation No. 5 : The bridge of the Main ent.**

For the bridge of the Main ent. steps and stairs :-

- a. The width for the concrete slab, will be 5.80m and the width for the granite flooring will be 6.00m ( 10 cm projection to each side )
- b. The steps will be canceled , the ramp will be for the total width of the ent. bridge .
- c. The Stainless Steel handrail design will be changed and will be extended up to axis 6.

**Variation No. 6 : The Ent. hall**

- a. A double door area with air lock enclosure will be added at the ent. hall .

**Variation No. 7 : The staircase beside the ent. hall**

- a. Relocating the. staircase at the ent. hall and adding new glass door.

**Variation No. 8 : The conference hall skylight**

- a. The sky light at the conference hall roof will be extended to cover the area from A to G.  
E G
- b. Mechanical external Alum. louvers ( with elect. Control system ) will be provided above the skylight at the conference hall.

**Note :-** required a proposal from Al Abbar Subcontractor for approval.



- c. The RCC supporting beam for the gutter of the skylight at the conference hall will be modified to galvanized steel frame supports. ( required a proposal from the steel Subcontractor for approval ).

**Variation No. 9 :**

- a. Toilets at Basement will be deleted .  
b. Changing rooms will be provided as per the attached drawings.

**Note :-** All finishes for wall, floor , ceiling and internal partitions will be as specified at the ground floor toilets.

**Variation No. 10 :**

- a. A prayer room and ablution room will be provided at basement.

**Note :-** We will inform you as soon as possible with the required details and finishes for that .

**Variation No. 11 :**

- a. All Solid partitions will be changed according to the attached design ( the upper glass part will be canceled ) and the side glass part will be for both sides ( instead of one side only as per the contract documents ).

- We hereby request you to submit on an urgent basis the cost for all the additional quantities ( based on the contract unit rates for the same items ) and your best offer for the new items which are not included the contract documents .
- We will then ,revise your offer and give you the approval to start with the necessary action for the variations work.

Thanks & Regards ,

CAB CONSULTANT

Eng. Hisham A. Fattah

كسب  
مهندسون استشاريون  
د. محمد فائق هويدي

CC : Mr Richard Middleton - STPC

**Figure 7.B.3 List of Variations**

### **7.B.5 FACTS AND CIRCUMSTANCES CONTRIBUTED IN DELAY**

As is often the case, the three main project parties all bear some responsibilities for delays. The previous sections indicate that the Client and the Consultant are primarily responsible for the delays in this project, although the Contractor made some mistakes, which contributed to some delays. The Client could have avoided many of the problems to reduce that caused delay, such as:

- 1) Failure of the Client to coordinate with the Government Authorities during the planning and of the need, collect information about FZA Permits, Approval of Engineering Department in FZA.
- 2) Continuing the involvement of the project management firm who prepared the feasibility study for the project.
- 3) Failure to appoint an experienced engineer who fully understood the design technicalities during early planning and design and to check the free zone area regulations for the direct coordination with the Client's administration.
- 4) Extent changes instructed during construction especially in finishes items.
- 5) Changing the scope of the external landscaping works and pavements and asking the Contractor to re-construct the whole works from the beginning.
- 6) Appointing the Fit-out nominated Sub-Contractor at very late stage during project construction without considering the technical and contractual obligations of the Main Contractor.

The above mentioned points made it difficult for the Consultant to achieve his responsibilities, from inception stage to handing over the project due to the followings:

- 1) The Consultant studied and prepared the design without referring to regulations of FZA Technical, Engineering Department.
- 2) Failure of the Consultant of providing the complete design for the superstructure works; he only specified in the Bill of Quantities that the slabs has to be a post-tensioned, without full technical details, specifications and detailed drawings. No available Contractor to design and work in short period of time available.
- 3) Poor coordination and communication of the Consultant's representative on site with the Main Contractor and the nominated Sub-Contractor. English language

ability (e.g. the contractual letters prepared was below standards). The Resident Engineer used to visit the site once a week and most of the decisions were taken on a weekly basis during his visits.

- 4) Poor coordination between the Consultant's representative and Free Zone Authorities during inspection. The Main Contractor was not required to be involved during inspection by the Technical Engineering Department of FZA as per rules and regulations.
- 5) Coordination between the structural drawings and other MEP, Finishes drawings were not adapted before submitting the drawing to the Technical Engineering Department of FZA for final approval.
- 6) Providing the Client with the options to delay the nominated Sub-Contractor of interior design works; this caused delay in providing information, delay in issuance the drawings, delays in execution of the work and interference with other work activities.
- 7) Not consulting with the Main Contractor on aspects of Fit-out and Interior Design work in Contractual, Technical and Legal aspects. Programme was affected due to problems that could have been jointly resolved.
- 8) Failures of the Consultant to choose the most appropriate type of Contract. Major work items had to be designed and coordinated together (such as GRC Wall Panels, Aluminium Glazing Panels, Canopy works and Post-Tension slabs). All the shop drawings needed to be coordinated for final approval before proceeding with the construction work. Design and Build Contract had been better suited to this type of project. It would potentially saved money and time for the Client.

The main feature of the contracting side is that, during tendering stage the engineering department should have advised the Consultant about changing the type of contract and should have understood the technical specifications with the method statement of the major works, such as GRC panels, aluminium works and canopy works. They priced these work items without full details, consequently they faced problems with Sub-Contractor, material supply from one side, and approval of shop drawing from another side (FZA Regulations).

Another reason for the Contractor's delay was incurring whilst signing the contract without visiting the site and understanding the laws, regulations, requirements. As a result, the difficulties of obtaining the work permits for the project and permit for the project resources were only identified after the contract was formed. The involvement of the top management of the Main Contractor was limited due to site location, most correspondence and communication was through fax. The Contractor's Project Manager was left to take his own contractual, technical and financial decision. If the technical department had visited the site regularly they would have been more experience in dealing with the Sub-Contractors and their construction methods, monitoring the planning and scheduling to control the cost, manpower and materials.

The Contractor's Project Manager was required to resolve technical problems in the sub-contracted work and assist the Consultant's representative in matters relating to the Sub-Contractor's works, specially the Fit-out works. Also clarifying technicalities, attending regular site meetings and become a communicator or translator. Because of the isolated project location, there was cooperation between the Client and the Contractor on site. However contract obligation has to be implemented properly, contractual letters documented properly together with the formats of site inspections and submittals and approvals of materials and drawings.

#### **7.B.6 SUMMARY OF CASE STUDY - II**

It is clear evident that all the parties involved in the project have contributed to the delays which confirm and support the primary and secondary data gathered through literature review and survey.

In this case, the project was handed over to the Client after two revised completion dates; the 1<sup>st</sup> revised completion date was on 31<sup>st</sup> Dec.1999 and 2<sup>nd</sup> revised completion date was on 31<sup>st</sup> March 2001. An extension of five months was granted to the Main Contractor with payment of all the associated costs. The major reasons behind the delay could be summarized as follows:

- 1) The Client's brief and project objectives were not presented very clearly to the project management initially appointed.
- 2) The Consultant did not have enough experience in the particular Architectural feature to be incorporated into the works.
- 3) Some technical specifications and detailed drawings were missing for the important items, such as post-tensioning works.
- 4) The Consultant's inspector had limited technical experience, communication skills and contractual knowledge to deal with Sub-Contractors.
- 5) Multiple changes by the Client and changes in the scope of work for external landscaping and pavement.
- 6) Construction process was not very clearly understood by the Client.
- 7) Entering the nominated Subcontracts at the late stage.
- 8) Lack of Contractor's involvement in the Nominated Sub-Contractors work aspects created changes and conflicts during finishes items.

After the project was handed over a report was submitted to the top management on what could be learned from mistakes, which had occurred during tendering stage and evaluation stage of the contract.

Since this project adopted the traditional procurement approach and accordingly to **Anderson W. (1997b)** *"The traditional approach requires the production of a complete set of documents before tenders are invited and some time must be allowed for this, to prepare a better drawings, details, contractual documents and specifications. It assumes that the design will be by a good Consultant, which is appointed by the Client and it may be implemented to ensure benefits in cost and quality but at the expense of time"*.

The above listed major reasons which caused the delay and also, according to the above statement of **Anderson W. (1997b)** there is a strong relation between the actual causes of delays and the primary causes and delays which establish and form a strong agreement that client and Consultant attributed in many factors of delay. This provides

a strong development for the project manager operating in UAE to reduce the occurrence and affects of the project delay.

*---- End of Chapter ----*

Copyhousewales

118 Broadway

Treforest

Pontypridd

CF37 1BE

Tel: 01443 407759

E: [copyhousewales@googlemail.com](mailto:copyhousewales@googlemail.com)

For all of your Yearbook, Dissertation & Binding needs